MACHINE TOOL BLUE BOOK

JANUARY 1944

HARDINGE
ELMIRA, N.Y.

Performance has established
Leadership for HARDINGE
High Speed Precision Lathes

WRITE FOR
DESCRIPTIVE
LITERATURE

MARVEL SAWS

In the thick of it . . .

In the battle of weapons you will invariably find MARVEL SAWS in the thick of it in private plants, arsenals, armories, airplane plants and shipyards. The MARVEL saws most widely used in armament work are: the No. 18 Giant Hydraulic Saw (above), MARVEL No. 6A and No. 9A High Speed Production Saws equipped with automatic bar push-up, and the universal MARVEL No. 8 metal cutting band saw.

On heavy duty, continuous operation, MARVEL High-Speed-Edge Hack Saw Blades will step-up output by permitting heavier feeds and high speed because they are *positively unbreakable!* These patented composite hack saw blades (with high speed edge welded to a tough alloy body) will permit any type hack sawing machine to operate continuously at full capacity.

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 Bloomingdale Ave., Chicago 39, U.S.A.

Eastern Sales Office: 225 Lafayette St., New York

...already helping scores of manufacturers...

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by Robt. Kinkead
Offers Graphic Solutions to Your Many Welding Problems

This new Hobart Service is a design stimulator to help you change over to arc welded design for production, processing or construction. Each subject is treated separately with sketches and general specifications to allow freedom of application. They're just the thing to stimulate ideas in planning for post-war competition; to help you design a superior product that can be produced faster at less cost, with great savings in material and labor. The wide variety of subjects covered gives designers in every field something to work from. Convenient, file size, sheets come to you as they're published. The initial set is FREE, so get on the mailing list today.

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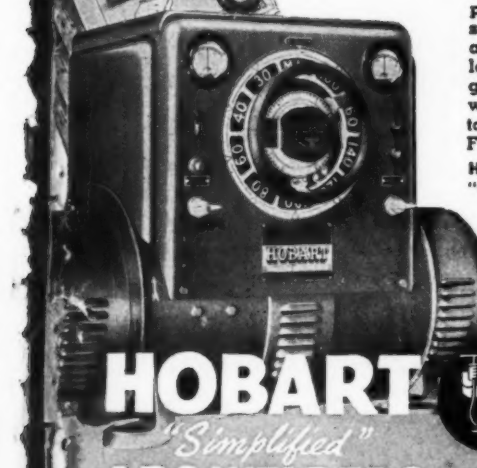

GAS DRIVE WELDER

PORTABLE ELECTRIC

USE THE HANDY COUPON NOW!

516 Page Manual and Lessons Book "Practical Arc Welding" on procedures and techniques at $2.00 ea.

HOBART "Simplified" ARC WELDERS

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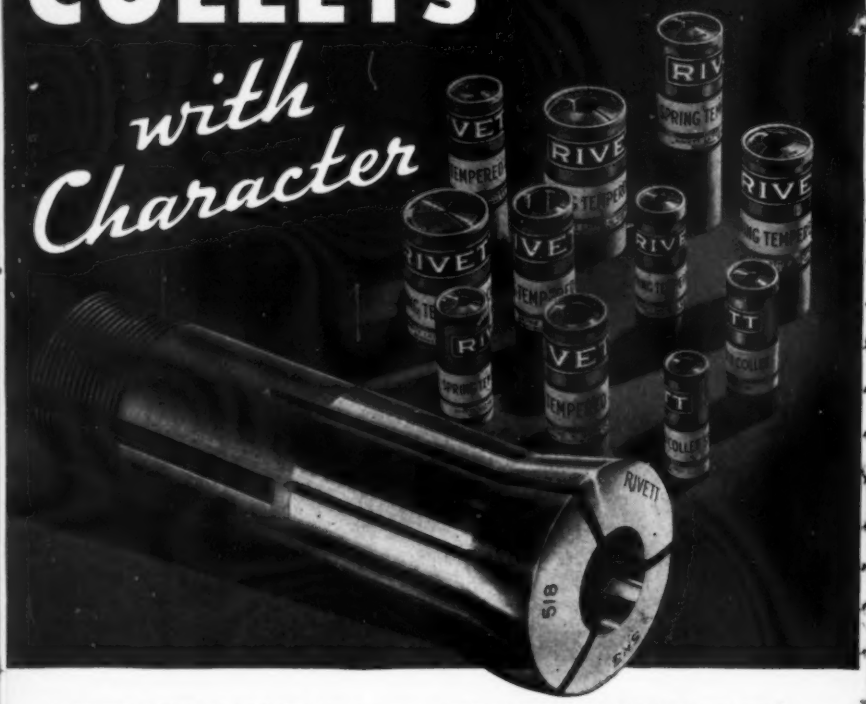
NAME _____

COLLETS *with Character*



A RIVETT DRAW-IN COLLET has personality derived from a worthy inheritance and a steadily improved environment. Today when a RIVETT COLLET is shipped in its distinctive carton it reflects fifty years of experience and the most advanced methods in manufacture and inspection.

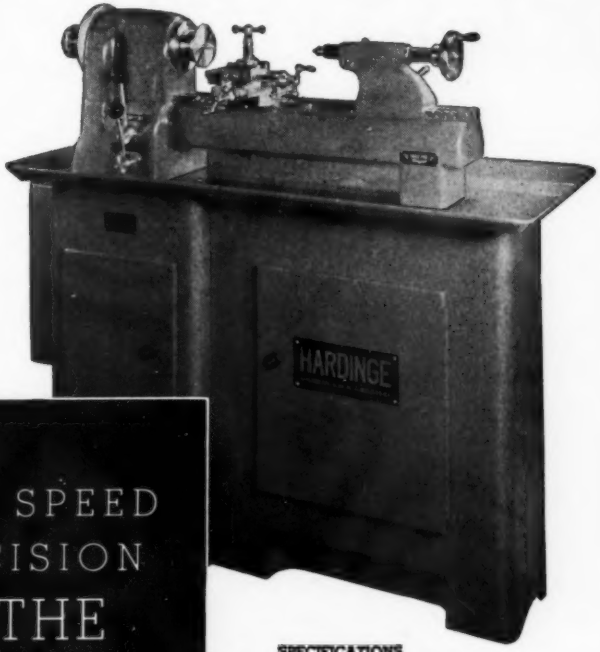
RIVETT DRAW-IN COLLETS are available in all standard styles for bench lathe, engine lathe, miller and grinder use. Work held in a RIVETT COLLET is guaranteed to run "dead true" at the collet mouth and within .002" two inches from the collet mouth. For complete information on all RIVETT COLLETS and their adaptation to existing machines write for Bulletin 100.

RIVETT

RIVETT LATHE & GRINDER, Inc.

BRIGHTON • BOSTON • MASS. • U. S. A.

HARDINGE



HIGH SPEED PRECISION LATHE

SPECIFICATIONS
1" collet capacity, 9" swing, 17" center distance, eight spindle speeds up to 4000 R.P.M.

Designed to meet requirements of extreme lasting accuracy, high spindle speeds and the ease in operation required for the smaller diameter work range found in every tool room, laboratory and production department.

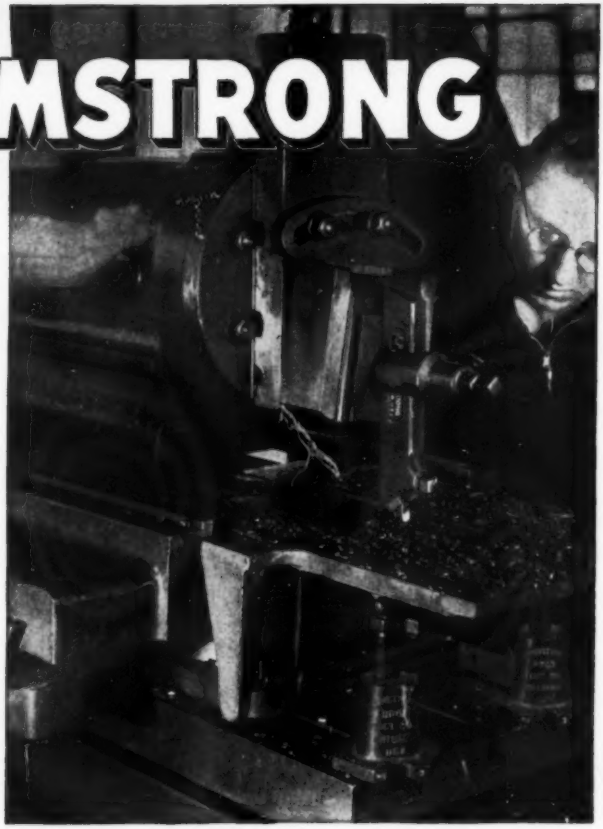
The simplicity of operation enables relatively unskilled operators to produce parts to the necessary close limits without expensive tooling. Your larger, expensive equipment will not meet all of the foregoing requirements necessary for practical results and proper economy.

Because of the many advantages found through actual use, Hardinge Precision Lathes are being installed in ever-increasing numbers.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR

HARDINGE
ELMIRA, N.Y.

ARMSTRONG



Be permanently tooled-up—ready for any War or Post-War Job

Each ARMSTRONG TOOL HOLDER is more than a highly efficient tool. It is a part of a complete "System" of tooling that provides permanent, multi-purpose tools for every operation on lathes, planers, slotters and shapers.

Now is the time to tool every machine tool with its full complement of ARMSTRONG TOOL HOLDERS. (1st) To increase War Production — with the correct ARMSTRONG TOOL HOLDER for each operation you can greatly increase speeds and feeds beyond "Standard" cutting speeds, can often double hourly output. (2nd) To be permanently tooled-up, able to instantly change over to any new War Product. (3rd) To be efficiently tooled-up and ready for post-war competition.

Write for Catalog today showing the complete "Armstrong System" and fill in the missing tool holders for each of your machine tools.

ARMSTRONG BROS. TOOL CO., "The Tool Holder People"
308 N. FRANCISCO AVE. CHICAGO, U. S. A.
Eastern Warehouse & Sales Office: 199 Lafayette St., New York

Machine Tool Blue Book

Hitchcock Publishing Co., 542 So. Dearborn St., Chicago 5

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JANUARY 1944

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Practical Boring to Limits Like This: +.0002" −.0001"

PRECISION BORING DATA

PART—End Bracket.
MATERIAL—Cast Aluminum with 1020 Steel Insert.
HOLDING METHOD—Special Fixture.
LOCATION—On Rabbit Fit Dia.
MACHINE—#200 Simplex Precision Boring Machine.
OPERATION—Bore 1.0230" Dia. Hole.
TOLERANCES—+.0002", −.0001".
FEED—1⅛" per Minute.
SPEED—1150 r.p.m.
FLOOR-TO-FLOOR TIME—4 Minutes, including inspection time.

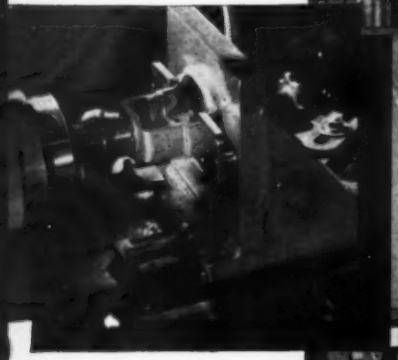
SIMPLEX UNIT-TYPE BORING MACHINES OFFER *Precision, Versatility and Speed*

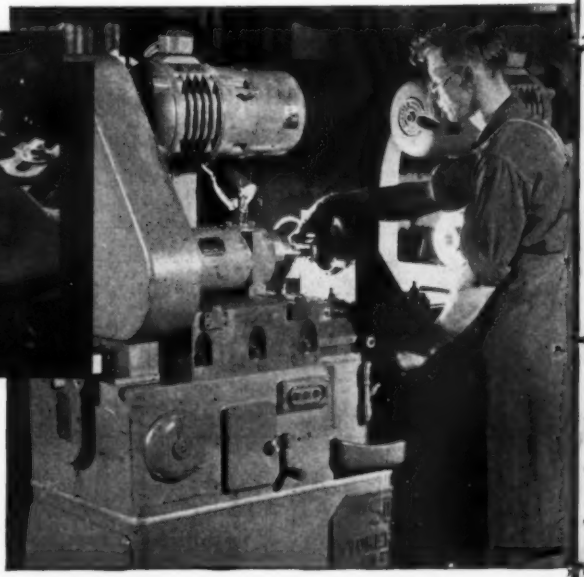
This Simplex Precision Boring Machine is designed for plants having a number of jobs of varying types to be handled by one machine. The bridges are made so they can be easily adjusted to suit the part being machined. A built-in electric facing control is provided with adjustable dwell.

END BRACKET PRECISION BORED IN 60 SECONDS

In this installation, an end bracket bore is machined to 1.0230" (+.0002", −.0001"). Boring Time is only 50 seconds. Finish is very smooth, and approximately 100 brackets are machined per tool sharpening.

Perhaps one of our 25 different basic models of Simplex Precision Boring Machines will serve you as well. Our engineers will be glad to make a study of your parts and production for faster and better precision boring. Send your part prints and production figures . . . no obligation.





FREE DATA

Write for these two booklets covering our complete line of precision boring machines. Complete specifications of each type are included. Ask for precision boring machine booklets.

STOKERUNIT CORPORATION

DESIGNERS AND BUILDERS OF PRECISION BORING MACHINES AND MILLING MACHINES
4530 WEST MITCHELL STREET · MILWAUKEE, WISCONSIN

"That Yankee gun they load on Sunday for the rest of the Week!"

These cynical and war-weary words were a Confederate soldier's description of a famous weapon of the Civil War. It was the Henry Rifle — a Yankee answer to a national emergency, back in the days of muzzle-loaders.

Benjamin Tyler Henry, the gun's inventor, was considered one of the greatest gunsmiths of the 19th century, and he helped to found the fame of Jones & Lamson in the early days of American industry . . . while the gun, in turn, commenced the fame of a great American company as the first of the world-famous line of Winchester Repeating Rifles.

* * *

It was on a Sunday that America looked up from the tragedy of Pearl Harbor and asked her industries for a Yankee gun — Today, Jones & Lamson machine tools and engineering are again helping to produce many Yankee guns such as this world has never seen before.

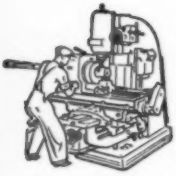
And after the war is over, our engineers and service men will play an equally important part in helping industry to convert to peacetime production . . . when new companies and products will once more stem from the men and the machines of America's oldest machine tool company. Call upon Jones & Lamson, now!

Universal Turret Lathes . Fay Automatic Lathes . Automatic Thread Grinders . Optical Comparators . Automatic Opening Threading Dies

J&L JONES & LAMSON MACHINE CO., SPRINGFIELD, VERMONT, U.S.A.
Profit-producing Machine Tools

CORRECT CUTTER SPEED

Selected without Walking Around



THIS type of job, like many others in the average shop, requires a change in spindle speed (cutter speed) to obtain any semblance of production, finish and cutter life. The part requires a milled relief around the main diameter at the large end. A 1-13/64" diameter end mill, running at 188 r.p.m., mills the principal portion of the relief. This leaves too large a radius at the end of the cut, so it is then removed with a .407" diameter cutter running at 550 r.p.m.

With CINCINNATI Quick Change Collets, the cutters are changed in a few seconds, and with the exclusive Dial Type feature of power speed and feed change from the front operating position, the speeds are changed as desired in a few clicks of the speed dial . . . without taking a step.

This one Dial Type feature alone is worthy of your most serious consideration when selecting new milling machine equipment. There are a host of other Dial Type features, too, some of which are tabulated in Sweet's Catalog File for Mechanical Industries. All of them, along with complete engineering data, will be found in catalog M-970-2, a copy of which may be had for the asking.

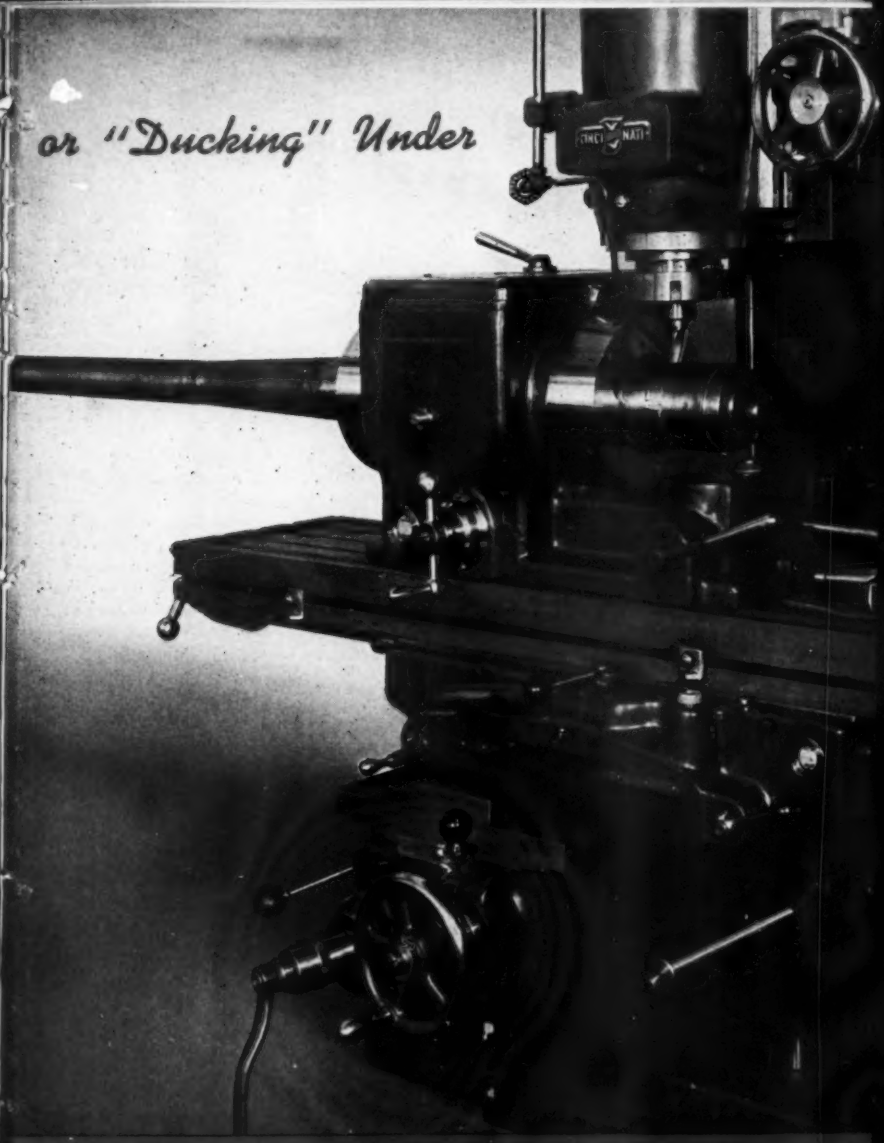
Left: CINCINNATI Vertical Dial Type Milling Machine. The Dial Types are made in plain, universal, and vertical styles, Nos. 2, 3, and 4 sizes, medium speed and high speed ranges. Complete engineering specifications may be obtained by writing for catalog M-970-2.

CINCINNATI

Right: A CINCINNATI No. 3 Vertical Dial Type Milling Machine, equipped with a special power feed rotary milling work head. The operation consists of milling a circular recess on the part. This job was tooled up by CINCINNATI Service Engineers, who will be glad to draw upon their experience in solving your unusual milling problems.

THE CINCINNATI MILLING MACHINE CO.

TOOL ROOM AND MANUFACTURING MILLING MACHINES · SURFACE BROACHING MACHINES · CUTTER SHARPENING



CINCINNATI GRINDERS INCORPORATED CINCINNATI, OHIO, U.S.A.

MACHINES . . . CENTERTYPE GRINDING MACHINES . . . CENTERLESS GRINDING MACHINES . . . CENTERLESS LAPPING MACHINES

TOOL ROOM AND MANUFACTURING MILLING MACHINES · SURFACE BROACHING MACHINES · CUTTER SHARPENING

I'D LIKE TO SEND A NOTE WITH THIS!

I'd say, "Here's a part that's **Fit to Fight!** Install it in a new engine or use it to repair an old one. You'll find that it fits *exactly!* I know, because I machined it . . . to a tolerance of ±.0005".

"That's what mass production calls for—parts that are accurate . . . identical . . . *interchangeable!* I get a lot of satisfaction out of doing this precision work on my Gisholt—making every part *fit to fight* for the planes that will help us win this war. And you can bet your sweet life that no Axis craftsman will ever beat me and my Gisholt at it. Good luck. Yours for Victory!"

Look Ahead..Keep Ahead..With Gisholt Improvements in Metal Turning

At Gisholt, the Army-Navy "E" and the Treasury Flag fly side by side

GISHOLT MACHINE COMPANY
1219 East Washington Ave. • Madison, Wis.

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES

What's Ahead?

No. 1 in a Series

Experts are working experimentally on a universal sign language for use during the period of reconstruction following the war. It has a vocabulary of about two thousand words and can be learned in about a month.

★

Reshingling of homes may be entirely eliminated after the war. With plentiful cheap aluminum as one of the benefits of the great disaster, we expect to have aluminum shingles, and the glass industry has already developed a lifetime glass shingle.

★

Radio waves are now being used to spread the layer of tin on tin cans and thinner than it was before the war.

★

The Diesel engine is close to its long-sought ideal of one pound per horse power. This may indicate that this thrifty engine, already scheduled to power our postwar trucks, may also be suitable for our pleasure cars.

★

Little by little new ideas combine to make flying more practical for tomorrow's civilians. One of these is a simple device for night landing which uses two lamps aimed toward the ground. The beams of these lamps are focused so that they come together to form a single spot of light on the ground when the plane is at exactly the right height for "setting down."

★

A new fuse for artillery shells is said to be so sensitive that it will explode the shell on hitting a raindrop.

★

The use of aluminum can reduce the weight of a freight car from forty-five thousand to fifteen thousand pounds with a corresponding increase in capacity.

★

Factories have been built with heating pipes permanently laid in the solid concrete floor. The method seems to be practical, economical and suitable for the heating of our homes.

★

In spite of the war, the Dutch have been able to produce a new hybrid plant, a cross between the carrot and the beet called the "wobbie"

To supply a Pacific coast shipyard with 152' one-piece keels for Navy minesweepers, giant trailers are being used that haul 60 tons of Douglas fir logs of this length.

★

Experiments are being made with artificial teeth held in place by magnets.

★

It is expected that vast amounts of magnesium will be used after the war, and it is encouraging to know that our supply is large and beyond the reach of the enemy. Although there is only fourteen one-hundredths of one percent of magnesium in sea water, there are four and one-half million tons in a cubic mile.

★

Fifty thousand patents, formerly the legal property of our enemies, are now available to American industry.

★

The electron microscope will now measure particles as small as one-millionth of an inch.

★

The Civil Aeronautics Administration expects us to have half a million private and commercial airplanes by 1950.

★

A new synthetic textile filament, the finest yet produced by man or nature, is so small that it takes twenty thousand miles of it to weigh a pound.

Automobile tires are now being checked for invisible flaws by passing high-frequency sound waves through them.

★

Plastic bearings for machinery will require no lubricants for moderate speeds and loads, and in many cases water has been found to give sufficient lubrication for even high speeds and heavy loads.

★

"Facsimile", a method of printing a miniature newspaper by radio in individual homes, was tried experimentally before the war began. By this method the printing is done during the night and a newspaper, complete with illustrations and advertising, is ready at breakfast time.

★

There is a very good chance that we may have television in full color and three dimensions. It may also be possible to store up television broadcasts to be re-run later.

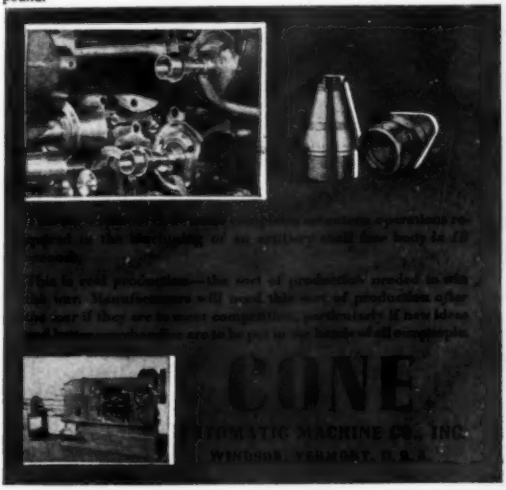
★

A micro-hardness tester is now made that can test a single microscopic grain of metal.

★

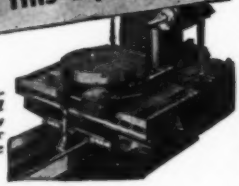
Shipwrecked sailors will soon have the benefit of a tiny searchlight no bigger than a walnut that is visible for 60 to 70 miles and good for 100 hours of use.

★

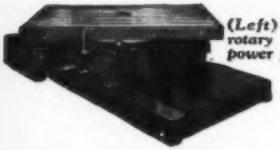


HOW and WHEN TO USE G&L Attachments and Accessories

Reduce Set-Up Time and Increase the Flexibility of Your Horizontal Boring Mill with This Equipment



(Right) Combination plain and hand feed rotary table with power take-off from table drive shaft.



(Left) Precision rotary table with power feeds.

One of the most flexible machines in your plant is the G. & L. Horizontal Boring, Drilling and Milling Machine. This flexibility and versatility can often be further increased through the use of attachments and accessories. Perhaps you can save more time through the application of one or more to your horizontal boring mill.

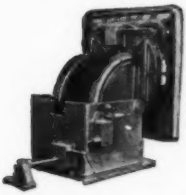
Rotary Tables

Rotary tables permit the machining of various surfaces without resetting the part. For instance, four or more sides of a workpiece can be machined by merely indexing the table to present the face to be machined to the machine spindle. G. & L. Rotary Tables are available from the simple, plain 24-inch diameter rotary table with ½° graduations up to the largest completely self-contained units weighing 55,000 lbs. with a rated capacity for parts weighing up to 25 tons.

GIDDINGS & LEWIS

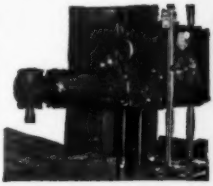
144 DOTY STREET

Universal Tilting and Rotary Tables



These units are primarily intended for use in connection with floor type machines. The table top can be rotated 360° and can also be tilted to any position from the horizontal to the vertical. Machining of angular surfaces and the boring and drilling of holes at various angles is greatly facilitated. This table is approximately 41" high and graduated in degrees and half degrees.

Angular Milling Attachments

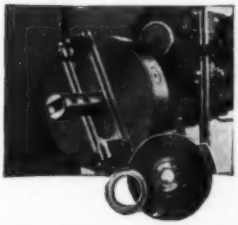


Angular Milling Attachments, like Rotary Tables, are used to minimize the number of settings of the workpiece.

They are usually furnished so that the head of the attachment is adjustable through 360° and clamped to any desired angle. In some cases, side and end milling attachments are recommended. These consist of two spindles operating at right angles to each other. Special angular attachments to suit your specific work can be designed and furnished.

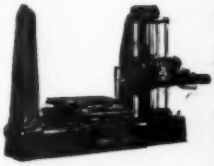
Continuous Feed Facing and Boring Head

This outstanding attachment permits facing and boring operations simultaneously and many other combinations of operations not ordinarily performed with the horizontal boring, drilling and milling machine. It is provided with a tool slide having six separate power feeds.



Combinations of Attachments and Accessories

Oftentimes, combinations of various attachments and accessories can be used to advantage in reducing set-up time and increasing production. G. & L. field engineers will be glad to work with you in making proper selections.



(Above) G.&L. 340 RT Machine with built-in rotary table.

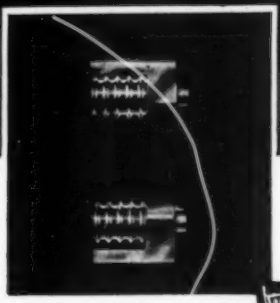
Write for Additional Data — this book covers the complete line of G. & L. time saving machines and accessories. Write for your copy today. Please indicate your business connection. Ask for Bulletin No. MM14.

MACHINE TOOL COMPANY

FOND DU LAC, WIS.

VARD John-Sons

Roll Thread Snap Gages



We are in quantity production on Vard roll thread snap gages with John-Sons concentric rolls.

Now, these well-known gage rolls, which can inspect either right or left hand threads, are mounted in the improved Vard frame with its hand fitting grip, wide machine pads for bench mounting and adjustable tolerance pins.

This gage is offered in 3 styles in National, Acme, Whitworth and Metric thread forms. Gages run in sizes from number series up to and including 12 inches and in 5/16" to 13/16" roll lengths. Write for literature.

VARD INC.

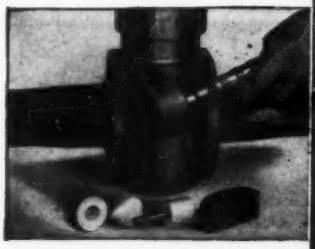
PASADENA, CALIFORNIA

Jarvis Flexible Shaft Machines

Jarvis Multiple-Speed Flexible Shaft Machines make it possible for the metal craftsman, the finisher, and the cleaner to have a universal tool suitable for rotary filing, sanding, grinding, polishing, and buffing. There are Jarvis Flexible Shaft Machines and Tools that will satisfactorily meet your requirements.

Write for our new catalog MFTI.

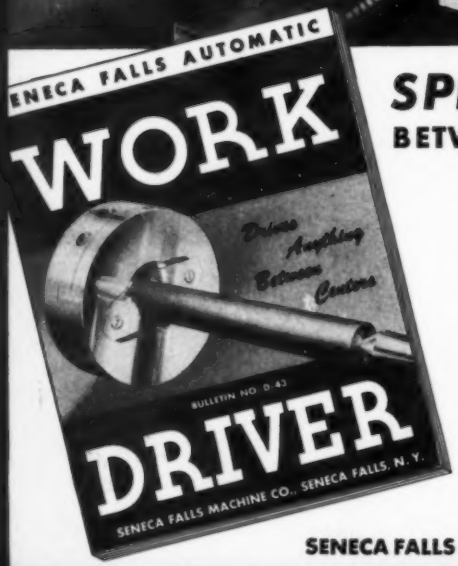
Jarvis Flexible Shaft Machines are used extensively in the aircraft engine industry and aluminum foundries; also in mold and metal pattern shops.



Jarvis Tools are made for efficiency and long life. For use with Jarvis Flexible Shaft Machines, in any finishing or cleaning operation.

THE CHARLES L. JARVIS CO., MIDDLETOWN, CONN.

TAPPING ATTACHMENTS • FLEXIBLE SHAFT MACHINES • GROUND ROTARY FILES



SPEED UP YOUR BETWEEN-CENTERS WORK

● The Seneca Falls Automatic Work Driver is a self-centering, quick-acting Driver designed to eliminate dogging time, thus permitting one operator to operate two or more machines. Its positive grip prevents slippage and resulting tool breakage. It provides greater safety for the operator since there are no projecting screws or sharp corners to catch clothing or injure hands. It can be used on any type of engine lathe, multiple tool lathe and on plain or universal grinders. Can also be used for certain work on turret lathes.

Now available in eighteen *standardized* models which can be ordered from our new catalog. Write for your copy today and utilize this proven Driver to help speed your war production.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

LATHE NEWS from SENECA FALLS

Standard Carboloy Tool Prices Now Generally Comparable to All Types of Cutting Tool Materials

THE STEADY INCREASE in acceptance of of Standard Carboloy Tools has made possible constant improvement in our quantity manufacturing technique to the point where highly efficient single-purpose equipment has been developed for practically all operations, effecting substantial economies in our mass production methods.

This has made possible a further price reduction—effective December 6, 1943—in the price of single point Standard Carboloy Tools to a level where they are now generally comparable, in price, with tools made of *ALL* types of cutting materials. These new, low prices now justify—more than ever before—your review of all single point tool turning, boring and facing applications not at present receiving the benefits of carbide use—in terms of increased production, faster machining speeds, better finish, longer tool life and lower cost per piece produced.

Send for revised price list covering 10 Standard Styles, 5 Standard Grades, for cutting steel, cast iron, non-ferrous metals, etc.

CARBOLOY COMPANY, INC., 11139 E. 8 MILE BLVD., DETROIT 32, MICHIGAN

Birmingham · Chicago · Cleveland · Los Angeles · Newark · Philadelphia · Pittsburgh · Seattle · Thomaston, Conn.

CANADIAN DISTRIBUTOR: Canadian General Electric Company, Ltd., Toronto, Ont.

FOREIGN SALES: International General Electric Company, Schenectady, N. Y.

CARBOLOY TRADEMARK

For Cutting CAST IRON and Non-Ferrous Metals

For Cutting STEEL

TUNGSTEN CARBIDES *** TUNGSTEN CARBIDES WITH TANTALUM AND/OR TITANIUM CARBIDES

BESLY

● Besly Taps, through their consistent performance, are helping to maintain American production at a wartime peak—as they helped to put it there.

Besly Taps are producing accurate threads through long, difficult production runs. Their correctly designed flutes speed chip removal, prevent damage and consequent tap breakage.

The peak of production at which we find ourselves means day and night work to give you service as dependable as Besly Taps. However, we can promise prompt attention to your order, with precision-built Besly Taps following as soon as possible.

Write for Catalog No. 67 —a compendium of useful knowledge for tap users.

BESLY BESLY GRINDERS AND ACCESSORIES
BESLY TITAN ABRASIVE WHEELS • BESLY TAPS

Charles H. Besly and Company, 118-124 N. Clinton St., Chicago 6, Ill. Factory: Beloit, Wis.

KENNAMETAL

5

KM

Rockwell 90.8 A—Strongest crater resistant grade, for roughing cuts on carbon and alloy forgings, bar stock, tubing, etc., with carbon content of .30% and above.

K3H

Rockwell 91.8 A—Harder than KM but not as strong. K3H, the most crater resistant grade, is recommended for finishing or moderate cuts on carbon and alloy steels .30% carbon and above, and also for general use on soft steels containing less than .30% carbon. Used widely for milling of steels.

K4H

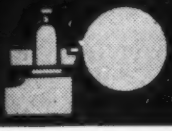
Rockwell 92.3 A—More resistant to edge wear than K3H but not as crater resitant. For precision boring and light finishing cuts on all steels. Very good for tools requiring large nose radius or where tool must dwell without cutting. Used widely for milling and extremely rough cutting of non-ferrous and non-metallic materials.

K26

Rockwell 91.5 A—A strong grade better able to withstand abrasion and sand inclusions than KM, but not as crater resistant. For roughing steel castings and for very rough cuts on cast iron.

K6

Rockwell 92.1 A—A straight Tungsten Carbide grade, more abrasion resistant than K4H, but with less impact resistance. For general use on cast iron, non-ferrous and non-metallics.



SUPERIOR CEMENTED CARBIDES

This Letter Wastes your time and Ours, too

Norton Company
Worcester, Massachusetts

Gentlemen;-

Please rush us at once by air express a new feed screw for a Norton external grinder. We must have part within one week as we are starting on a Government sub-contract for the U. S. Navy.

Your prompt attention to this order will be very much appreciated.

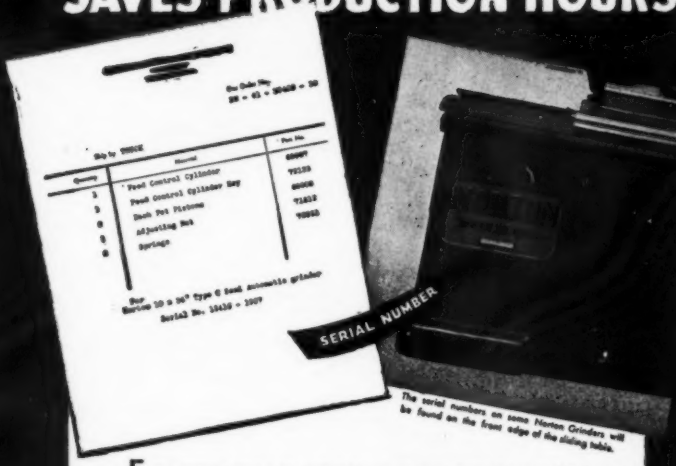
Sincerely
I.B. Pompous
Chief Purchasing Agent

GRINDERGRAM

Use a flood of coolant directed onto the contact point when truing, thus keeping the wheel face and diamond cool, smothering dangerous and damaging dust and preventing excessive diamond wear or possible damage to the stone from overheating.

NORTON and

COMPLETE INFORMATION SAVES PRODUCTION HOURS



The serial numbers on some Norton Grinders will be found on the front edge of the sliding table.

EXAGGERATED? Not a bit of it! Daily we get many similar letters to that shown on the left page. Too seldom is full information available as above.

Styles in feed screws have changed in the past 40 years; hence a request for a "feed screw for an external grinder" is meaningless.

It takes time to hunt down obscure parts from such indefinite clues. Correspondence to clear up the mystery wastes still more time, stalls your production.

So—if you want prompt action when ordering a vital part for that "out of production" grinder; following up an order scheduled on our books; asking for one of the many Norton manuals on machine operation and service; seeking a certain Norton machine to turn out top-flight production; or taking advantage of any of the many Norton services, supply FULL INFORMATION. It will save your time and ours; time best devoted to War Production.

NORTON COMPANY, WORCESTER 6, MASS.

M-456

GRINDERS
Lappers

Several hundred ARTER ROTARY GRINDING MACHINES are employed by Wright Aeronautical Corporation in the tremendous production of aircraft for war and victory. To build the necessary horsepower into an aircraft engine requires machinery that produces the highest degree of perfection.

Photo—Douglas SBD "Dauntless" U. S. Navy bomber—powered by a Cyclone 9 of 1000 horsepower, manufactured by the Wright Aeronautical Corporation, Paterson, N. J.

ARTER GRINDING MACHINE COMPANY

WORCESTER, MASSACHUSETTS • U. S. A.

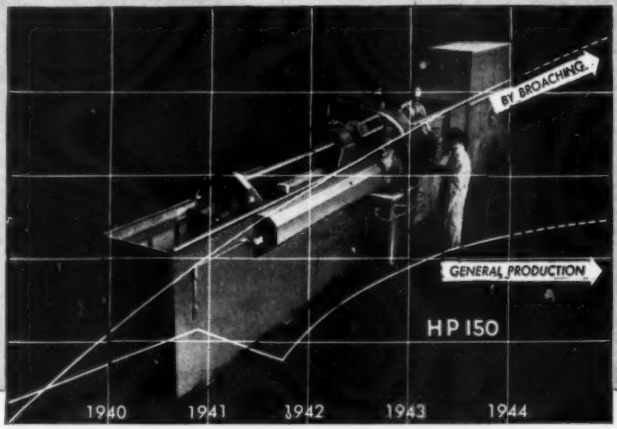
PROTECTION...

of Vital Production

of Vital Manpower

of Vital Time

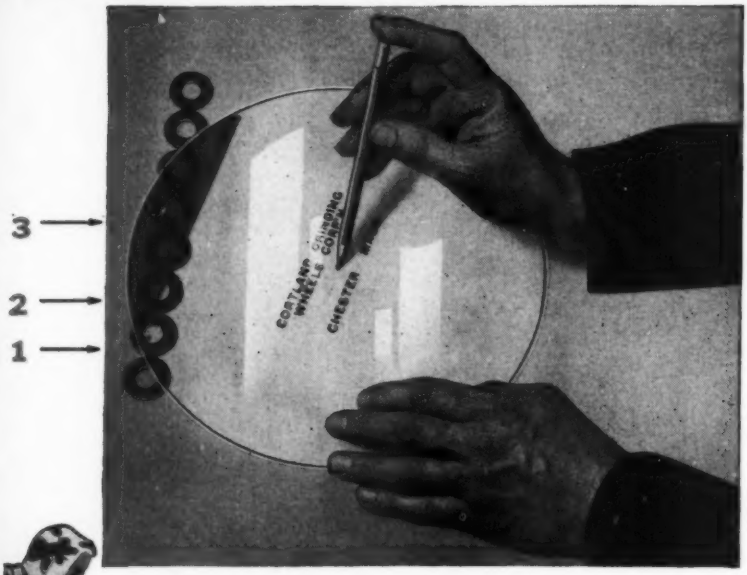
BROACHING PRODUCTION FIGURES BASED ON ACTUAL SURVEY—



ARMY E NAVY

LAPOINTE Machine Tool Company

HUDSON, MASSACHUSETTS, U. S. A.



He looked through this Disc . . .

He was a harassed manufacturer, in the midst of renegotiation. Not a particularly good time to call and try to talk about grinding wheels . . .

"Grinding Wheels? Hell — I need *lapping* compounds! Look at these specifications: S.A.E. 52100 — 63-65 Rockwell C scale — *surface finish 2 micros* — and production's gotta be stepped up! . . . *What's that thing?*"

"Just a piece of clear plastic. It represents the segments in your vertical spindle grinders. Now imagine that these washers are the *work* on your tables. Would you mind rotating this disc counter-clockwise . . . slowly . . . **1** See how the narrow end of the Cortland Segment starts to pass over the work? Shock and resistance minimized; large surface still exposed to coolant . . .

"Keep going . . . **2** Watch the action of the straight inner edge of the segment — See how it travels *diagonally* over the work? We call it *Diagonal Shearing* — with varying contact it *shaves* off the metal . . .

"Keep going . . . **3** Now the segment is in full surface contact with the work. Maximum heat is generated, but only momentarily, because as the segment continues to pass across the work, more and more of the ground surface is again exposed to the action of the coolant.

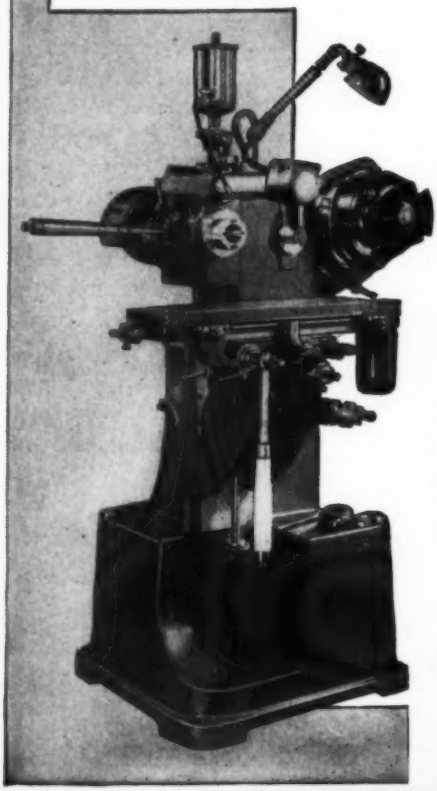
"That's the story back of the success of Cortland Chucks and Segments — *Diagonal Shearing* with varying contact — for better, faster cutting; minimum shock; maximum area exposed to coolant; and ground material swept aside. Better surface grinding, less segment wear, less power needed, lower overhead and maintenance . . . All good answers, yes . . . ?"

and Found the Answer*

* . . . the Answer to a problem in Surface Grinding. The problem may involve a Profilometer reading of 2 microinches; or hardened steel parts that heat and squeal; or table loads that take too long to grind or require too much amperage, or need too many segment dressings. . . . You'll find these problems *solved* — and many more in the true case histories presented in the Cortland Chuck & Segment Bulletin. For a free copy write on your letterhead to Cortland Grinding Wheels Corporation, 9 Cortland. St., Chester, Massachusetts.

CORTLAND
Chucks and Segments

NEARLY 3000 NICHOLS MILLERS IN SERVICE



But Not One Full-Time Field Service Man Required!

This outstanding record results from uncompromising quality and correct design.

Toolroom Accuracy
Unrivaled Flexibility
Low Cost

explain why the NICHOLS Miller is a recognized leader for Production, Tool-making, or Laboratory.

Investigate the multitude of unusual operations illustrated in the new 86 page Nichols Handbook. A helpful guide covering Milling — Profiling — Boring — Facing and Grinding. Ask for a free copy!

RANGE:

Longitudinal—10" or 19"
Transverse—7"
Vertical-Knee—13½"
Spindle Rise and Fall—4½"
Standard Speeds to 2400 RPM
Special Speeds to 5000 RPM

Immediate Delivery.

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50 CHURCH STREET, NEW YORK, N. Y.
DEALERS IN ALL PRINCIPAL CITIES

How to Reduce Costs on CHUCKING WORK

Turning pre-formed parts the "long way" is too slow and too costly. To meet modern mass production conditions, National Acme now offers to industry a new line of 4, 6 and 8-Spindle Chuckers.

These new machines operate with the same high speeds, the same precision, and have the same broad adaptability that have made Acme-Gridley multiple spindle bar automatics such important war production tools.

New! **ACME-GRIDLEY 4, 6 and 8-SPINDLE STANDARD UNIVERSAL CHUCKER with Adjustable Hydraulic Control**

The new machines have extreme flexibility of tooling and adaptability to a wide variety of work. Their accuracy meets the latest war-born standards. They have the precision that comes only from proper weight distribution, rigidity and balance, with freedom from vibration.

Our Engineering Department will gladly consult with you to select the proper type and size to handle your work. Orders are now being booked for near-future delivery. New Catalog CM-43 gives complete details.

★ ★ ★

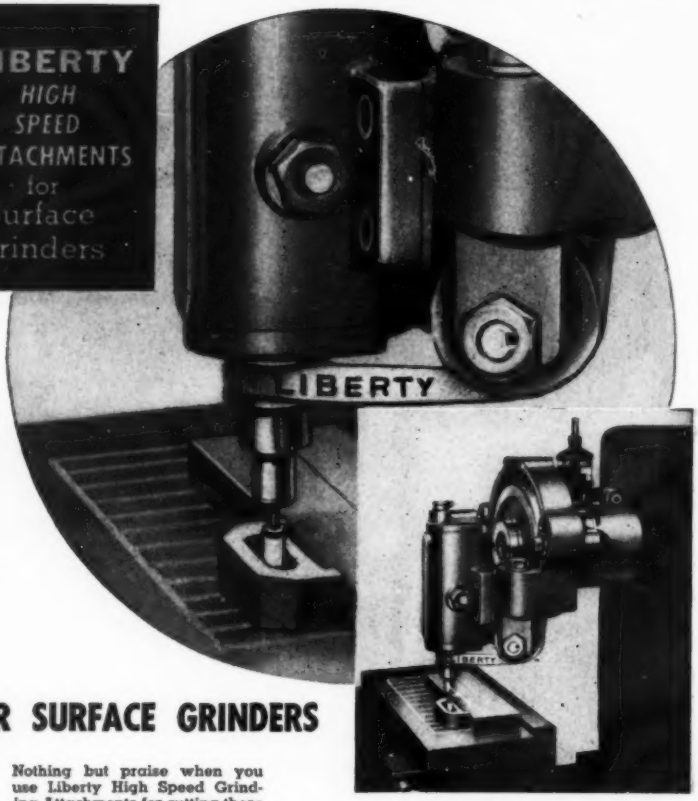
New Acme-Gridley Chuckers are engineered for new production and accuracy records—to produce more at lower costs.

THE NATIONAL ACME CO.

170 EAST 131ST STREET • CLEVELAND, OHIO

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS • THE CHRONOLOG • LIMIT AND CONTROL STATION SWITCHES • SOLENOIDS • CENTRIFUGES • CONTRACT MANUFACTURING

LIBERTY
HIGH
SPEED
ATTACHMENTS
for
Surface
Grinders



FOR SURFACE GRINDERS

Nothing but praise when you use Liberty High Speed Grinding Attachments for cutting these "difficult to get at" jobs.

Their spindles are preloaded by an ingenious spring arrangement that guarantees perfect static and dynamic balance, and may be had with solid quill or collet chuck.

Grinding to close tolerances in blind end slot.

Liberty Vertical attachment illustrated here, and the Liberty Horizontal Attachment are precision tooled for greatest accuracy, and may be assembled to your grinder in 2 minutes without machining.

Send for Circulars.

LIBERTY TOOL & GAGE WORKS INC.

231 GEORGIA AVE. **PROVIDENCE, R. I.**

Tomorrow's Tools for Today's Tasks

HEADQUARTERS FOR SPECIAL CUTTING TOOLS

A·C·E·

When you want something really special you go to headquarters for it—don't you? And so when you want special cutting tools for that difficult tooling job you go to headquarters for special cutting tools—A.C.E.

Here at A.C.E. we make specials by the dozen—instead of standard tools by the thousand. Naturally we have to know how to make all kinds of specials—and make them accurately and economically.

Send your inquiries for special cutting tools to A.C.E.—we make nothing else. We have modern machinery and equipment, modern methods, operators trained for many quick set-ups and we have the "Know How" to turn out tools that meet your requirements in accuracy, precision and workmanship. Bulletin on request.

AMERICAN CUTTER & ENGINEERING CORP.
31741 MOUND ROAD . . . WARREN, MICH.

AMERICAN CUTTER
AND ENGINEERING CORP., WARREN, MICH.

SPECIALIZING IN HIGH SPEED CUTTING TOOLS TO TOOL STEELS

Who said "GREEN HELP"?

The new worker isn't a stranger to the intricacies of aircraft bending very long —not with a Buffalo Aircraft Type Bending Roll on the job. By means of simple manipulation of easy-working controls, this specially designed Buffalo Bending Roll handles the most difficult bending of arcs, circles and spirals. It's practically automatic! Inexperienced operators are quickly trained, turning out accurately formed stock on a brisk production basis—and with a minimum of fatigue. These tools—embodying all the principal features required by aircraft builders are available in a range of sizes. Data in Bulletin 3344.

BUFFALO FORGE COMPANY
161 Mortimer Street **Buffalo, New York**
CANADIAN BLOWER & FORGE CO., LTD., Kitchener, Ont.

"Buffalo" AIRCRAFT TYPE **BENDING ROLLS**

WHEN THERE'S WORK TO DO . . . .

United States Electrical Tools Do It

"Give us the tools," industry shouted, "and we'll produce the ammunition, the planes, the ships, the guns. But do it on the double-quick."

Our response was a thunderous, "You bet! We'll give you better electrical tools than ever and more of 'em."

And today THE UNITED STATES ELECTRICAL TOOL COMPANY is still doing its share . . . a big share . . . in helping you, the men who are pouring forth an endless stream of things the war effort demands

FLEXIBLE SHAFT MACHINES — For overhead or floor mounting. The power transmitted by a flexible shaft is governed by the diameter of the bore and the speed at which it is operated. Motors are ball-bearing; 40-degree ratings and will stand a momentary overload of more than 100%.

The UNITED STATES ELECTRICAL TOOL Co.
CINCINNATI, OHIO

TODAY...OUR CATALOG IS OUR STOCK LIST

761 STOCK ITEMS

ALL OF WHICH CAN BE DELIVERED WITHIN

48 HOURS

End mills that you need immediately are in stock—ready for shipment to you from the Putnam Tool plant or from the headquarters of a number of the Putnam sales representatives. In addition, complete stocks are now built up on end mill holders, continuous pilot counterbores and spiral fluted chucking reamers.

The items available include not only all popular sizes and types but many which, from any other source, would be considered special tools. To facilitate your production schedules . . . to get the maximum in tool economy . . . it's to your advantage to think of Putnam tools *first!*

TOOLS THAT
• CUT FASTER
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High Speed Red Hard • Continuous Pilot Counterbores • Spiral Fluted Chucking Reamers

ARMY NAVY

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2983 Charlevoix Ave. • Detroit 7, Michigan

ACRO

Die set pullers

GONE FOREVER—battered and damaged die sets caused by prying or hammering. **ACRO DIE SET PULLERS** do the job the **FIRST** time. No Delay. Use **ACRO PULLERS** for safe sure separation. They are fast—accurate—positive. War plants using these pullers report savings as high as 50% in time alone.

ACRO PULLERS are indispensable for the grinding, mounting and fitting of punches, enabling the operator to raise punch from die easily, quickly and smoothly, positively holding the set at any desired height.

Order a set today. Convince yourself of the savings you can make in your tool room. **ACRO PULLERS** furnished in three sizes. Write now for more information.

PROMPT DELIVERY

ACRO METAL STAMPING CO.

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GRIPPING FORCE 15 TIMES AIR LINE PRESSURE!

America's war plants are switching to new, powerful Speedy Air Vises! From a single vise . . . to an installation of fifty . . . they are saving time, effort and labor costs! Air operated, *foot controlled*—both hands are left free for more rapid drilling, tapping, light milling, assembly, etc. Complete with Foot Control Valve, Air Hose and Fittings, only **$24**

DELIVERY 7-10 DAYS! ORDER FROM YOUR MILL SUPPLY DEALER OR WRITE DIRECT

AIR REGULATOR
Precision-built. Delivers pressures up to 140 lbs. With gauge, $4. Less gauge, $2.50

AIR FILTER
Keeps water and particles out of the regulator and pneumatic tools. $1.50

BLOW-GUN
Looks and operates like a gun. Ideal for cleaning and blowing out chips, dust, filings, scraps, etc. . . $2.50

W. R. BROWN CORP., 5724 ARMITAGE AVE., CHICAGO 39, ILL.

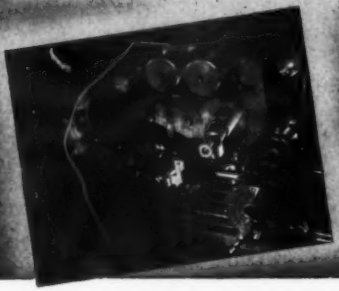
ACCURATE AT ANY ANGLE!

OBLIQUE

Grinding grooves in rolls for tube forming machine, with Dumore mounted on compound of engine lathe, using special bracket of simple design.

VERTICAL

Dumore No. 5 mounted vertically in a Bridgeport Universal Miller, grinding the contours of a motor lamination die. For vertical mounting, the quill is provided with a special oiling system to assure adequate lubrication of the top bearing.



OVERHEAD

Ingenious mounting of Dumore on double overarm of Milwaukee Miller, permits free use of table for attaching indexing fixture in grinding teeth of gear hob.

Amazing versatility of the Dumore together with its high precision convert any available machine tool into a special purpose precision grinder for a wide variety of operations. Catalog 42 is full of helpful suggestions and application data. Get a copy; write today!
The Dumore Company, Grinder Division, Racine, Wisconsin.

Dumore
PRECISION and Off-Hand GRINDERS

SOLD BY AUTHORIZED DISTRIBUTORS IN ALL PRINCIPAL CITIES

Tannewitz
METAL CUTTING BAND SAWS

. . . are constantly effecting truly amazing production increases, with corresponding reduction of costs, in the cutting of:

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SHEET STEEL and NONFERROUS METALS — BOTH FORMED AND FLAT

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CUTTING OFF GATES AND RISERS FROM CASTINGS OF ALL SIZES AND TYPES OF METAL

•

CUTTING LARGE BLOCKS OF ALUMINUM, MAGNESIUM and OTHER METALS

•

DI-SAWING — INSIDE AND OUTSIDE FILING and POLISHING

•

The complete line affords machines to accommodate work of any size. Take the first step towards eliminating the bottle neck of metal cutting by writing for bulletins listed at left.

BULLETINS

Worth Writing for:

SHEET METAL CUTTING BAND SAWS

•

SINGLE AND VARIABLE SPEED BAND SAWS FOR FOUNDRY USE

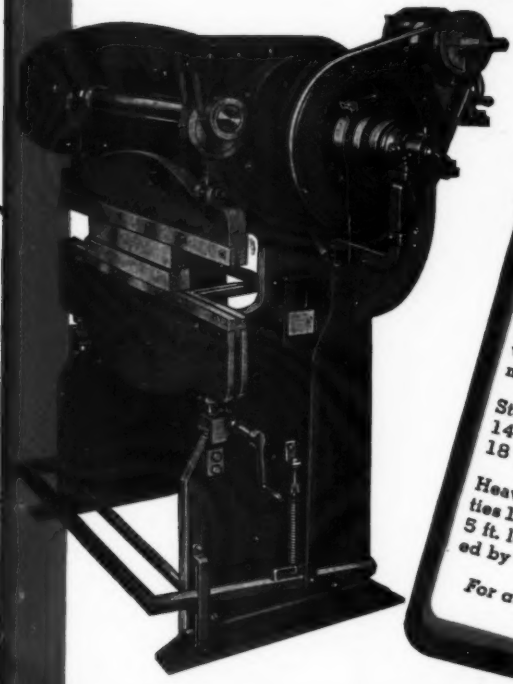
•

BAND SAWS FOR DI-SAWING, FILING and POLISHING

THE TANNEWITZ WORKS, GRAND RAPIDS, MICH.

POWERFUL

CHICAGO STEEL PRESS BRAKE



This No. 253 is a POWERFUL, rugged, inexpensive Press Brake, designed and built to the standards of Chicago Steel Forming Presses.

This money-saving production tool will handle 40 to 50 percent of the work done in an average shop. Greater speed, higher efficiency—much lower operating cost—plus the highest quality material and sturdy welded construction as in our larger machines.

Standard Series—3 sizes—capacities 14 gage, 4 ft. long; 16 gage, 5 ft. long; 18 gage, 6 ft long.

Heavy Duty Series—3 sizes—capacities 10 gage, 4 ft. long, V die; 12 gage, 5 ft. long; 14 gage, 6 ft. long. Powered by ¾ to 1½ h. p. motors.

For additional information write for catalogs.

DREIS & KRUMP MANUFACTURING CO.

7440 LOOMIS BLVD., — CHICAGO, ILL.

2 IN ONE

DUST COLLECTOR AND AIR FILTER

Designed for the removal and separating of the air from fine dust, arising from grinding, butting and polishing wheels, sand belts, scratch wheels and abrasive cutting wheels, or any other dust producing apparatus.

Made in three sizes to fit your individual machines. Economical in operation. Conserves heated air in cold weather. All units designed for air speed necessary to convey various material. A 3" static suction at 5000 ft. velocity.

Write for detailed folder.

- A two in one High Efficiency Dust Collector.
- A Health and Money Saving Apparatus.
- A Portable Self Contained Unit.
- A Positive Clean Air Filter.

DUST LOCK AIR FILTER CO.

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CHICAGO, ILL.
Phone ARMitage 2682

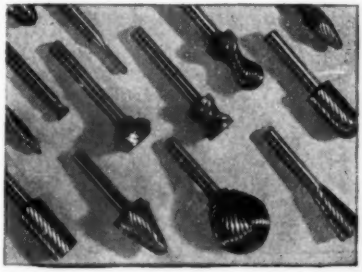
SEVERANCE DISC CUTTERS SPEED FINISHING OF PLASTICS

When it comes to finishing moulded plastic parts, you can't beat Severance Cutters. One efficient installation is shown here. A Severance rotary disc cutter mounted on a spindle with an adjustable table allows perfect finishing of the rough edges with amazing speed. Severance disc cutters are made of High Speed Steel, in a wide range of sizes. Staggered pattern teeth produce a shearing cut, eliminate chatter.

If you are having difficulty in finishing manufactured parts, send samples. Our Engineers will design cutters to solve your problems.

Severance complete line of "Carbide" Midget Milling Cutters are now available.

Severance



Severance Tool Industries Inc., Saginaw, Michigan. Plants in Long Island City, N. Y.; Detroit, Mich.; Fort Wayne, Ind; Chicago, Ill. and Los Angeles, Cal.

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SPOT · BUTT · ARC

We manufacture a complete line of resistance spot welders from 1/4 to 300 KVA for all types of welding. There is an EISLER WELDER for every purpose.

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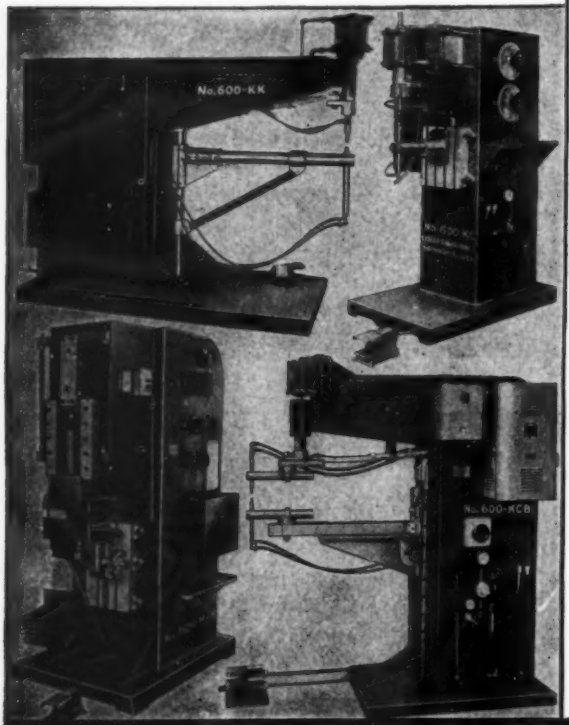
WE INVITE CONTRACT SPOT WELDING IN LARGE OR SMALL QUANTITIES.



ARC WELDERS
100 TO 400 AMPS.

BUTT WELDERS

FOOT
AIR
MOTOR
OPERATED

SPOT WELDERS

PRESS
TYPE

SPOT WELDERS
FOOT, AIR
OR MOTOR OPERATED

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MILLING CUTTERS • BROACHES • FORM TOOLS • END MILLS • HOBS

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CATERPILLAR TRACTOR
CRUCIBLE STEEL

REPEAT ORDERS FROM WORLD FAMED MANUFACTURERS TESTIFY TO THE DEPENDABILITY OF THE MODERN LAKE SHORE PLANT AS A SOURCE FOR YOUR SPECIAL REQUIREMENTS IN ECCENTRIC FORM RELIEVED MILLING CUTTERS AND GEAR HOBS

MILLING CUTTERS • BROACHES • FORM TOOLS • END MILLS • HOBS

Back of every Lake Shore Tool are the facilities and skilled personnel of one of America's most completely equipped plants.

LAKE SHORE
TOOL WORKS
Division of Carbide Tool Company

Send us your blue prints for quotations on your high speed tool, special tool, and carbide production tool requirements.

816 NORTH KOSTNER AVENUE • CHICAGO 51, ILLINOIS

Precision
CENTER OF CENTERS

is made for the smallest tool room lathes as well as the largest railroad shops. Severe conditions are no hazard to the accuracy and long life of the large taper thrust and annular roller bearings. Precision mounted, front bearing cone seats on resilient pad—a shock absorber protection against tool breakage. Available in taper shank, slip in, slip over and spindle types. For unconditional proof, test in your own plant.

Utility Sleeve

will cut tool costs. A saving of at least 40% (some users report 75%) with this removable taper shank tool driver. It is used with taps, drills, countersinks, reamers, end mills, center drills, counterbores, woodruff cutters, etc. The sleeve is a two jaw collet in action, fitted over the diameter of the shank of tool, which is positively driven by flats or the tang on shank end.

SPECIAL BULLETIN GIVES FULL INFORMATION ON UTILITY TOOLS.

THE J. C. GLENZER COMPANY, INC.

6465 EPWORTH BLVD. - DETROIT, MICH.

NUCUT TWO-FILE FILING HELPS STEP UP WARTIME PRODUCTION

2-FILE FILING ... at every file stroke!

COARSE TEETH cutting deep, clean, fast! Fine teeth levelling the surface smooth! There, in a word, you have the NUCUT "two-in-one" File.

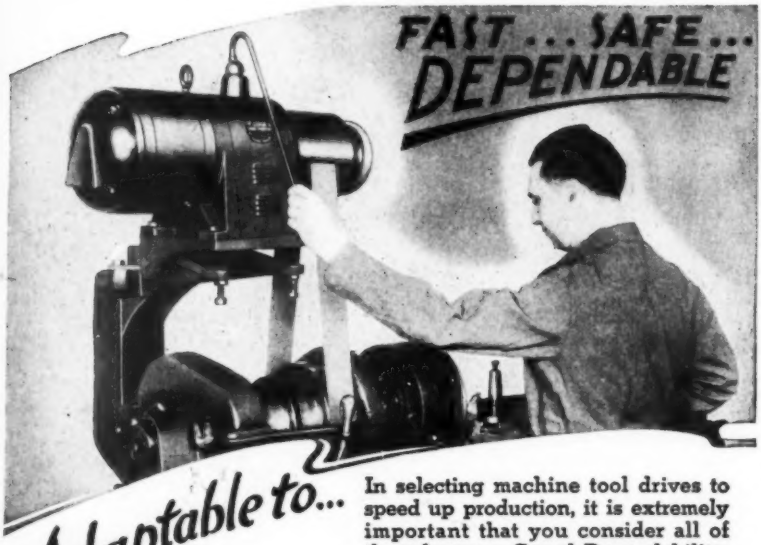
Possessing both coarse file teeth and fine file teeth, positioned in a patented scientific "Wavy Row" design, it does two file jobs at every stroke. Without clogging! Without skidding or scraping! Whether you are cutting, shaping or finishing, you will find a NUCUT gives you more work faster, easier, with less effort. See your distributor for the lengths, shapes and cuts you need for stainless steel, iron, aluminum, brass, copper, slate, wood, fibre and plastics.

NUCUT "WAVY TEETH"

This magnification shows the patented (No. 2027039) "Wavy Teeth" design that makes a NUCUT a twofold-filing file. This feature assures faster, easier, smoother filing and helps you meet today's stepped-up wartime production demands.

HELLER BROTHERS COMPANY
America's Oldest File Manufacturers
Good Tools Since 1836
Newark, N. J. • Newcomerstown, Ohio

HELLER NUCUT WAVY TEETH FILES



Adaptable to...

LATHES
MILLING MACHINES
SHAPERS
BORING MILLS
GEAR HOBBERS
DRILLS
AND MANY OTHER MACHINES REQUIRING SELECTIVE SPEEDS

Large enough to successfully serve you, yet small enough to give personal attention to your needs.

In selecting machine tool drives to speed up production, it is extremely important that you consider all of these factors... Speed, Dependability, Safety and Ease of Operation, Improved Lighting and Flexibility in Machine Positioning.

Lima Gearshift Drives are engineered to give you all of these advantages, and built to withstand the toughest production schedules without interruption.

Investigate Lima Gearshift Drives today. Install them now for Faster War Production, and for Greater Peace Time Profit after the war is won. Write or wire today for address of Lima Engineering Service nearest you.

THE LIMA ELECTRIC MOTOR CO.

272 FINDLAY ROAD

LIMA, OHIO

REPRESENTATION IN MOST PRINCIPAL CITIES

LIMA GEARSHIFT DRIVES - LIMA ELECTRIC MOTORS
LIMA MAGNETIC POLISHING LATHES - LIMA PEDESTAL GRINDERS

Announcing THE MOST IMPORTANT END MILL DEVELOPMENT IN 20 YEARS!

MELIN *Long Life High Speed* 3-FLUTE END MILLS

AT LAST! An End Mill that ***combines*** in a ***single tool*** all the advantages of two and four flute mills with none of the disadvantages of either!

★ AFTER YEARS of research, Melin Mills introduces the significant new MELIN **3-FLUTE** END MILL. It combines the fast stock removing qualities of the two-flute mill with the smooth finishing qualities of the four-flute mill.

THIS REMARKABLE **3-FLUTE** construction provides perfect balance and permits roughing and keyway milling to be done within closer limits . . . and with a smoother finish. All decarburized metal is ground off the cutting edge of the tool. Double backoff insures a stronger cutting edge and the **3-FLUTE** construction assures extra sturdiness, reducing breakage to a minimum.

WRITE TODAY FOR COMPLETE DETAILS AND NEW CATALOG

MELIN MILLS

DETROIT 2228 Bellevue Ave.

GRAND RAPIDS 1331 Phillips, S.W.

MELIN MILLS
2228 Bellevue Ave., Detroit 7, Mich.
Without obligation, please send me
☐ Complete details on MELIN 3-FLUTE END MILLS.
☐ New Catalog No. 6 and literature.

NAME_____ TITLE_____

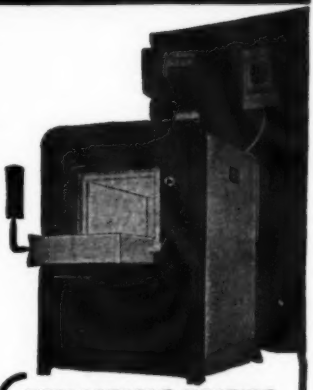
COMPANY_____

CITY_____ STATE_____

SAVE TIME AND MONEY THESE 5 DIFFERENT WAYS

This small compact electric furnace is inexpensive, handy and easy to operate—ideal for small tool and die shops—saves time these five different ways:

1. Eliminates delays in sending small machine parts out to overcrowded commercial heat treaters.
2. Saves time and expense of drawing or tempering small metal parts in large furnaces.
3. Cuts handling time when normalizing or annealing small parts. No waiting.
4. Conveniently available for pre-heating for subsequent high-speed hardening.
5. Eliminates shut downs and delays in servicing emergency repair orders.



AVAILABLE IN TWO SIZES

Type	Chamber Capacity	Amps 115 V	Watts	Amps 230 V	Price
MH-3	8"W 6"H 14"L	29.6	3400	14.8	$124.00*
MH-4	10"W 6"H 18"L	....	4800	20.9	$191.00*

*Includes Hearth Plate

MAX. SAFE TEMPERATURE—Continuous operation, 1750° F.; Intermittent operation, 1850° F.

AUTOMATIC CONTROL—Indicating Controlling Pyrometer—Thermo-couple and lead wire complete—$152.40.

REPLACEABLE HEATING ELEMENTS—Replaceable nickel chromium resistors embedded in rectangular refactory blocks. Elements form inner walls of furnace chamber, and may be replaced easily and quickly after removing rear panel—furnace structure remains undisturbed.

FREE Complete data covering specifications, additional applications and ordering instructions are included in this new folder. Write for your copy today. Ask for Bulletin No. 50.

COOLEY ELECTRIC MANUFACTURING CORP.
32 SOUTH SHELBY STREET • INDIANAPOLIS 7, IND.

Improve Precision with Sav-Way MASTER SETTING AND CHECKING ROLLS

For Accurate Tool Checking

Your precision tools and inspection devices are only as accurate as the methods and gages by which they are set and checked. In many cases, flat gage blocks are not adequate. This Sav-Way Set of Master Setting and Checking Rolls provides for the first time a really accurate means of checking micrometers, snap gages, amplifiers, and dial indicators. You'll be surprised at the low cost.

Set consists of twenty rolls ranging from .100" to 2.000" in diameter. Hardened, ground, and lapped to X gage tolerance. Housed in modern transparent plastic case.

Send Coupon for Circular

Sav-Way INDUSTRIES

4875 E. EIGHT MILE ROAD, DETROIT, MICH., U. S. A.

Sav-Way Industries, Box 117, Harper Station, Detroit 13, Michigan, U. S. A.

Please send circular describing Sav-Way Master Setting and Checking Rolls.

Name.....

Firm.....

Address.....

City.....

HERE'S A *Machine-Saver!*

●There's less strain and wear on your machines and machine parts when you use Sutton collets because Sutton's patented Diamond Grip takes horizontal and rotary thrusts at an angle and holds tightly with 10% to 15% less tension.

And, because slippage is reduced to practically zero, you can step up machine cycles to tool capacity—boost production and cut costs while cutting down wear and repairs. Patented Diamond Grip is self-cleaning—dirt, scale and chips work out automatically—does not clog—*costs no more than ordinary collets.*

See our representative or send for Catalog No. 15

SUTTON TOOL COMPANY

2895 W. Grand Blvd. Detroit 2, Michigan

SUTTON Diamond Grip **COLLETS**

A FREE TRIAL WILL SHOW YOU

CMD CENTER POINT LUBRICANTS

Protect Tools Better

Because CMD Center Point Lubricants can withstand pressures greater than 50,000 pounds per square inch, they provide maximum protection for lathe centers, grinder centers, gages, screw machine cams and quills and other precision built tool parts. Try CMD Center Point Lubricants on your toughest job and see for yourself. Mail the coupon for generous free samples now.

The center shown above is the famous *CMD Helical Groove Center* which has a left-hand helical groove that conveys the oil constantly to the extreme point of the center.

CMD

CENTER POINT LUBRICANTS

Write for FREE Sample Kit

CHICAGO MANUFACTURING & DISTRIBUTING CO.
Dept. 1-BB, 1928 W. 46th St., Chicago 9, Ill.

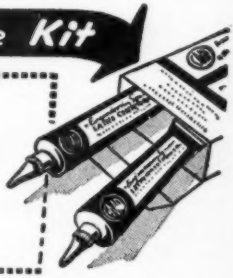
Without obligation please send us a free sample kit of one tube of CMD Center Point Oil and one tube of CMD Center Point Lube. Also send Catalog describing CMD Helical Groove Centers.

Mr. ..... Position.....

Company .....

Address .....

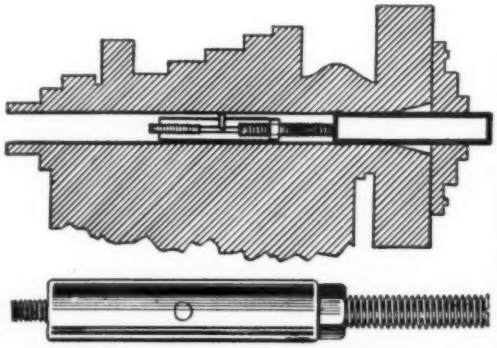
City ..... State.....



STEP-UP YOUR LATHE PRODUCTION WITH THE CARLSON *Spindle* LATHE STOP

The Carlson Spindle Lathe Stop is designed to speed up and simplify lathe operation, especially in machining parts on a mass production schedule. When placed at correct position in spindle for first part, it automatically provides permanent set-up for remaining parts to be machined to same dimensions, regardless of quantity. The Stop can be placed anywhere within the spindle. It is fitted with an adjustable screw which can be extended out in center of chuck jaws when chuck is needed for working on small parts.

- SPEEDS OUTPUT
- REDUCES REJECTS
- SAVES SET-UP TIME
- ASSURES ACCURACY
- REQUIRES ONLY SEMI-SKILLED LABOR



EASILY ATTACHED
The Carlson Spindle Lathe Stop can be installed in a few minutes. When ordering, please mention make and model of lathe; also specify inside diameter of lathe spindle.

MODEL No. 101 — Inside diameter ¾-inch fits South Bend, Logan, Atlas, Sheldon, and other make bench-type lathes. PRICES ON OTHER SIZES FURNISHED ON REQUEST **5.95**

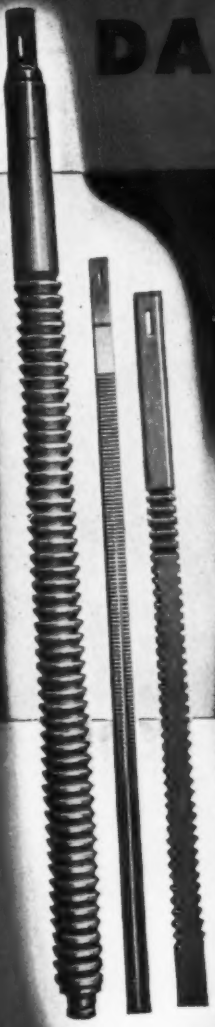
DEALERS' INQUIRIES INVITED

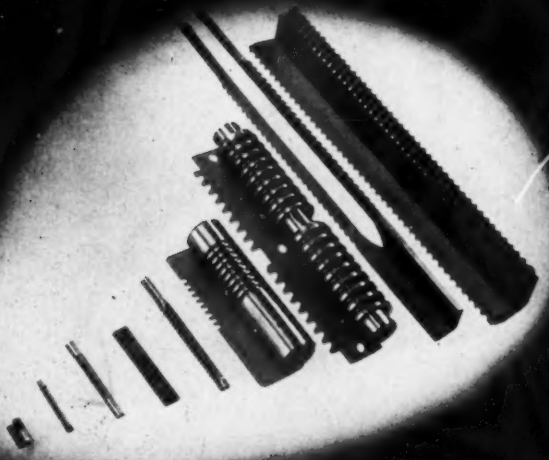
SCHULTZ & ANDERSON CO.

111 EDISON PLACE, NEWARK 5, N. J.

MANUFACTURED BY GREENFIELD MACHINE & TOOL WORKS

DALZEN *Broaches*





ROUND AND FLAT . . . IN A COMPLETE SIZE RANGE

For maximum parts per grind plus maximum grinds per broach specify Dalzen Broaches.

Dalzen broaches are ground from your blueprints by precision craftsmen with years of experience in broach making. Flat broaches are available in any size; round broaches, in any size up to 7/8".

When ordering, give make and number of machine, length of stroke and type of holder.

A DALZEN WILL DO IT! Dalzen tools — taps, flat and round broaches, thread rolling dies — have the same high reputation for accuracy and dependability as Dalzen Thread Grinders and Master Lapping Machines. Sturdy, compact, efficient, Dalzen machine tools give maximum production per cubic foot, per pound, per dollar of cost. Write for descriptive literature.

DALZEN

TOOL & MANUFACTURING CO.

12255 EAST 8 MILE ROAD • DETROIT

★ *There's a Reason*

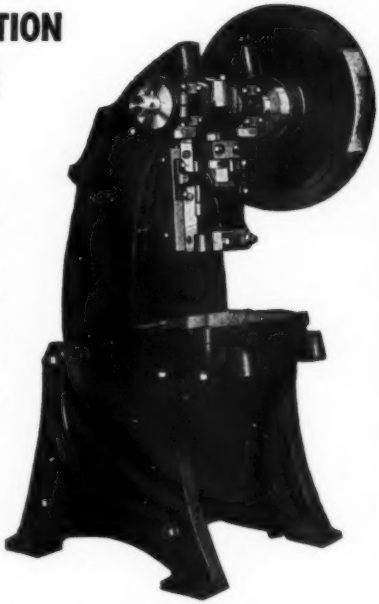
WHY MARSHALLTOWN PRESSES GIVE YOU

★ **BETTER PRODUCTION**

★ **LONGER LIFE**

Yes, you can rely on the performance of a Marshalltown Press — they give you the most for your money, because they are engineered and built for dependable trouble-free service. Features include — more die space, chrome molybdenum cranks, wrist pin connections and many other proven advantages.

Write today for literature about Marshalltown Presses — available in capacities from 5 to 70 tons.



NO. 5 FLYWHEEL TYPE

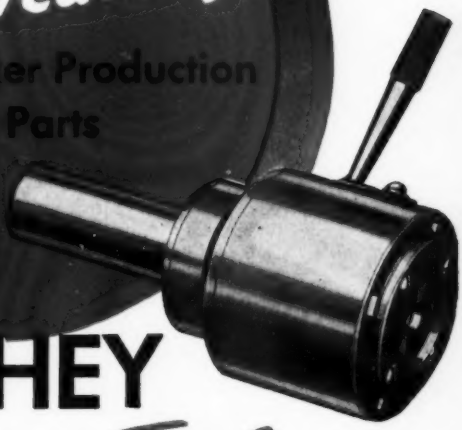
MARSHALLTOWN MFG. CO.

900 E. Nevada Street MARSHALLTOWN, IOWA

For Fast Accurate Threading

and for Quicker Production on Threaded Parts

There's Nothing Like



MURCHEY

Threading Tools

4 WEEKS DELIVERY

● This Type "G" (non-rotating) Self-Opening Die Head has established an enviable record. It is regarded with highest respect and admiration wherever threaded parts are needed to help win America's production battle. Type "G" is designed and engineered for use on any machine where die heads do not rotate. Made in sizes from 7/16" up to and including 6".

Write for literature on Type "G"—also on a companion product, Type "C-O" (rotating); on Collapsible Machine Tap Type "B-M" and on Murchey Thread Milling Machines, Shell Tapping Machines and Roller Pipe Cutting-off Machines.

MURCHEY MACHINE & TOOL CO., Dept. M-2—DETROIT 26, MICH.

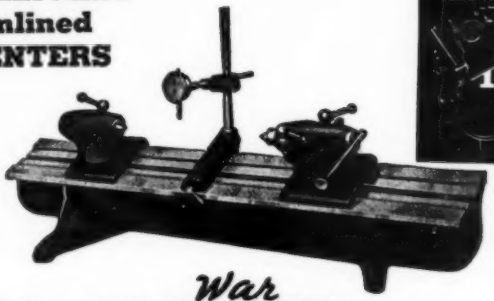
MURCHEY

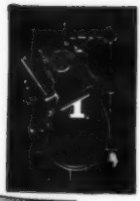
PROMPT DELIVERY
on Streamlined
BENCH CENTERS

3 SIZES

8" x 36"
6" x 24"
4" x 10"

Also available with riser blocks to increase capacity.





"IN TIME OF ~~PEACE~~ *War* PREPARE FOR ~~WAR~~ *Peace*"

Where can you make a better investment right now, when war production is vital, and for the future, when peace promotes competitive conditions, than in American tools and gages to speed production?

American Bench Centers are an improved design. Box section bed supported on three feet — always sits solidly on bench. Inclined face allows more room for operator's hands — prevents misuse as "catch all" for tools. Both heads adjustable and locked by clamping lever. Spring operated foot stock on larger sizes — retracting lever permits removal of work without changing adjustment. Special gaging fixtures designed to meet special checking requirements.

AMERICAN THREAD CHECKER

Checks threads on pitch diameter to "tenths". Takes work up to 5 in. diam. Furnished with ¾" x 4" anvil or 3¼" x 6¼" platen. Special anvils and platens available to meet your requirements. Recommended and used by both manufacturers and users of thread grinding equipment.

Send for Bulletin 43-BB for further details and data on American Amplifying Gages, Hole Checkers, Radius Dressers and Lapping Plates.

THE AMERICAN GAUGE CO.
125 Bayard Street **DAYTON, OHIO**

Gages of all Types and Sizes for

CARTRIDGE CASE INSPECTION...

MANUFACTURERS of CARTRIDGE CASES are cordially invited to write for a Price List on our complete Gaging System for Cartridge Case Inspection.

THIS SYSTEM INCLUDES

NEW GAGES

GAGE INSPECTION SERVICE

GAGE RECONDITIONING SERVICE

Shown above are two extremes in size of the maximum profile chamber gages that we manufacture.

EST. 1929

QUALITY TOOL AND DIE CO.

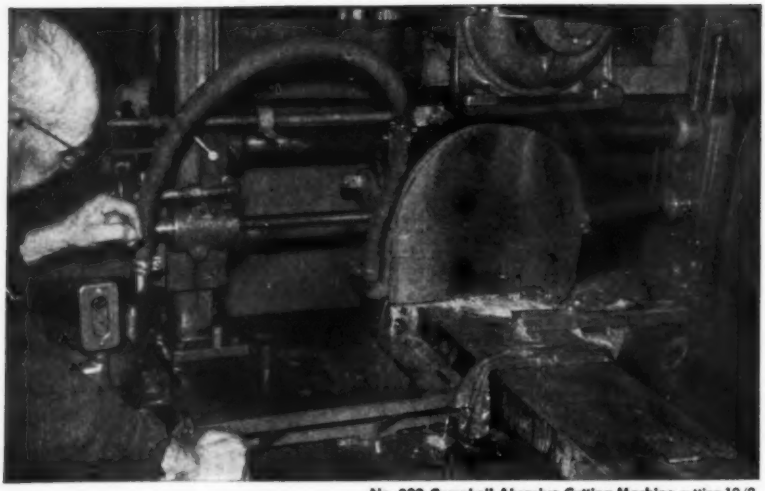
REG. U. S. PAT. OFF.

E. Vermont and Noble Sts.
Indianapolis 2, Indiana

ARMY E NAVY

Speed Victory
BUY WAR BONDS

MANUFACTURERS OF "QUALITY PRODUCTS"



No. 302 Campbell Abrasive Cutting Machine cutting 18/8 Stainless Steel forging blanks from slab 2⅝" x 10" x 14'

Campbell DOES ANOTHER PRODUCTION CUTTING JOB THAT "COULDN'T BE DONE"

● The job placed in the lap of a nationally known manufacturer of drop forgings made it necessary to cut 18/8 Stainless forging blanks from flat stock 2⅝" x 10" x 14'—cut-off lengths 9¾".

Without a **CAMPBELL**, cuts took so long that it was impossible to maintain production.

Now a **CAMPBELL No. 302 ABRASIVE CUTTING MACHINE** makes those cuts in 10 minutes—finished, burr-free cuts to dimension, without waste.

If you write the Campbell Engineering Department, they will develop production procedure and costs for you, too, without any obligation.

State materials, shapes and sizes you are cutting. Give lengths of stock, lengths of cut-off pieces and production rate required.

The data worked up for you will be based on actual experience. Remember **CAMPBELL** manufactures the only complete range of abrasive cutting machines—8 types and 19 models—and these machines are currently cutting all grades of steel, annealed and unannealed, non-ferrous alloys, plastics, glass and ceramics. Solid bars, tubular and flat stock.

Campbell **ABRASIVE CUTTING MACHINES**

ALSO MANUFACTURERS OF A COMPLETE LINE OF NIBBLING MACHINES

ANDREW C. CAMPBELL DIVISION • BRIDGEPORT • CONNECTICUT

AMERICAN CHAIN & CABLE COMPANY, Inc.

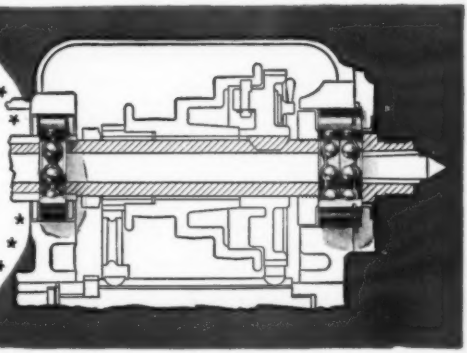
BRIDGEPORT • CONNECTICUT

SUSTAINED *Spindle Accuracy!*

A FINER FEATURE OF LOGAN LATHES*

Brief
SPECIFICATIONS

- Swing over bed 10½"
- Bed length 43⅛"
- Spindle hole 25/32"
- Precision ground ways: 2 prismatic "V" ways; 2 flat ways
- 12 spindle speeds—30 to 1450 per minute



Precision, Pre-Loaded Ball Bearing Headstock is Standard Equipment on All Models

To assure sustained spindle accuracy on Logan Lathes, the headstock is equipped with precision, "pre-loaded," New Departure Ball Bearings. This pre-loading prevents cutting tool pressure, either radial or thrust, from causing more than a negligible deflection of the spindle. Being grease sealed, as well as pre-loaded, the bearings require no lubrication or adjustment during their entire life. This special ball bearing equipment permits higher operating lathe speed, enabling the user to take every advantage of modern, high speed cutting methods. Thus, production can be increased and unit costs reduced.

Write for catalog sheets giving complete specifications.

LOGAN ENGINEERING COMPANY
CHICAGO 30, ILLINOIS

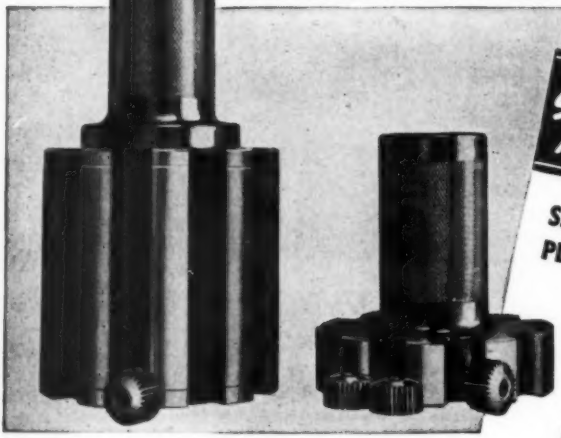
Logan

A NAME TO REMEMBER WHEN YOU THINK OF LATHES

*This advertisement is one of a series describing the finer features of Logan Lathes... Look for the next of the series

GREAT LAKES
Broach & Gage Company

1005 Franklin St. . . . Detroit 7, Michigan



STANDARDS FROM STOCK

S.A.E. SERRATION PLUG GAGES

•

EXCELLENT DELIVERIES at the Present Time

BROACHES:

Round . . . Sectional . . . Keyway . . . Spline . . All Types, All Sizes . . .

GAGES:

Serration . . . Straight and Involute Splines, Male and Female.

MASTER GEARS and MASTER INDEX PLATES

Splined Arbors for gear-grinding, hobbing, shaving and checking.

GEAR DESIGNING AND ENGINEERING

— — — Form Cutting Tools — — —

Specialists in Manufacturing or Re-Conditioning Hob-Sharpening Master Index Plates

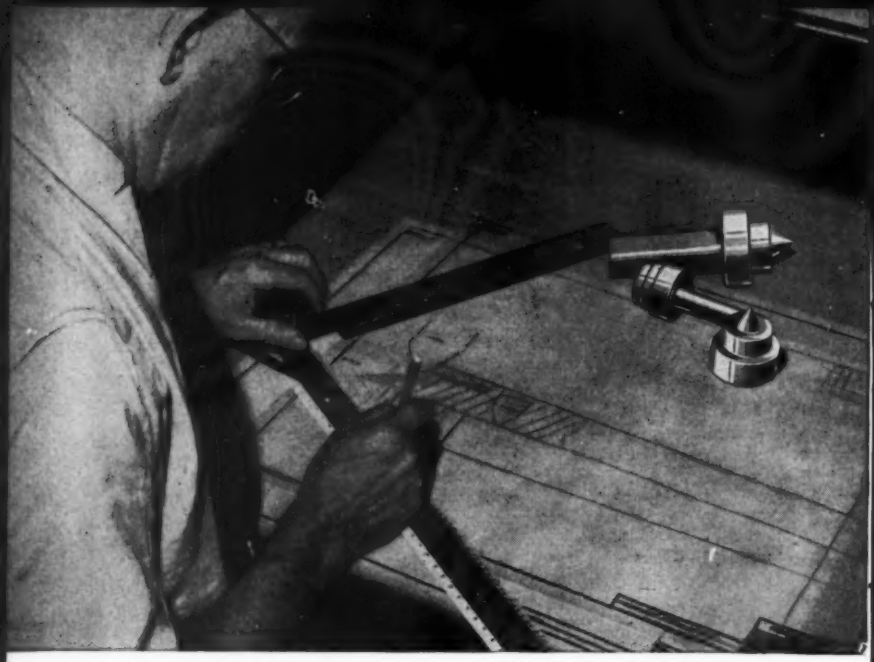
B&G Co.

Your ISD always was ready—is ready now

Alert to their Country's needs, Industrial Supply Distributors have rendered distinguished service through each of America's major wars during the past 100 years. The Fighting men depend upon the Nation's mills and factories to keep supplies moving to the front lines—the Production men rely upon Industrial Distributors to keep *their* supplies moving up too. Your Industrial Supply Distributor is continually at your call—in war and peace alike. For Cle-Forge High Speed Drills, Peerless High Speed Reamers, and everything else you need to keep your production going—

Telephone your ISD FIRST

ARMY
NAVY
ARMY
NAVY
The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49th STREET
CLEVELAND
30 BEAVER ST. NEW YORK
9 NORTH JEFFERSON ST. CHICAGO
650 HOWARD ST. SAN FRANCISCO
6600 SECOND BLVD. DETROIT
LONDON - S. P. BARNES, LTD. - 20-36 JJ UPPER THAMES ST. E.C.4
CLEVELAND DISTRIBUTORS EVERYWHERE ARE READY TO SERVE YOU



ENGINEERED LIVE CENTERS

A properly designed Live Center is one of the fundamentals of setting up a job and requires a specialist's experience. Characteristic of the design of all STURDIMATIC LIVE CENTERS is a low overhang and a slight cushioning action that compensates for expansion due to heat shock and excessive thrust loads—reducing wear to a minimum. Send us your blueprints and specifications—we will see that your job gets set up with the right Live Center. Standard shanks with Morse taper carried in stock.

STURDIMATIC TOOL COMPANY
5220 THIRD AVE., DETROIT, MICH.
LIVE CENTERS

THE DIE-SINKER WHO *wasn't satisfied*

Fully 30 years ago, he decided there must be some less tedious way to "clean up" his dies . . . to get the hard, sharp contours true to the blueprint design. So he himself invented the way—and the hand-cut rotary file thus arrived to substitute quick precision for tiresome drudgery.

His experience then—and through the score of subsequent years devoted to rotary file pioneering—is all part of RFC history. Many hundreds of industrial plants have profited by this experience . . . and today recognize RFC HAND-CUT ROTARY FILE accuracy and speed as genuine factors in promoting War plant and essential civilian-use production.

●

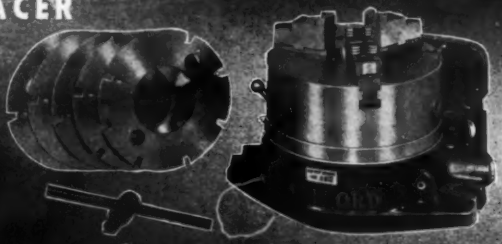
How can RFC rotary files help you? A discussion may uncover applications—and important benefits—that may surprise you. Or, write for the RFC catalog.

6

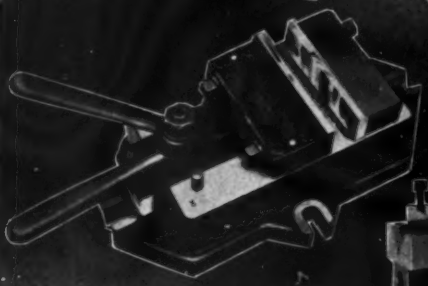
The ROTARY FILE COMPANY

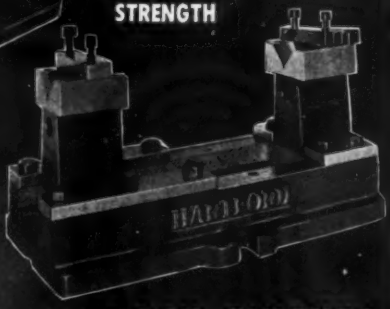
HARTFORD

SUPER-SPACER
RAPID INDEXING
MILLING
DRILLING
GRINDING
SLOTTING



MILLING VISE
POWER
SPEED
ACCURACY
STRENGTH



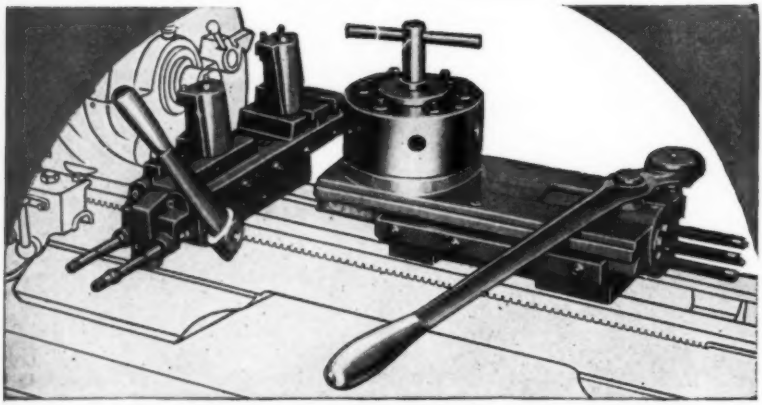


HARTFORD SPECIAL MACHINERY COMPANY
HARTFORD, CONNECTICUT

V-BLOCK FIXTURE
MILLING
BORING
INSPECTION

NAMES THAT RATE Four Stars IN AIRCRAFT MOTOR HISTORY
ALLISON
CONTINENTAL
PRATT & WHITNEY
RANGER
ROLLS-ROYCE
WRIGHT-AERONAUTICAL
BUICK
CHEVROLET
DODGE-CHRYSLER
NASH
PACKARD
STUDEBAKER
It's a "Four Star" rating for American planes, powered by these big-name motors — all leaders, on the way to Victory!
In tooling up for their production, these companies now making aircraft motor history, have relied on WESSON . . . the name that rates "Four Stars" for precision in Carbide Cutting Tools . . . now symbolizing new standards of precision in the cutting tool industry.
WESSON engineers are ready to cooperate with you in tooling up for machining new modern, tougher metals . . . faster . . . to closer tolerances and finer finishes . . . for present war production and post-war planning.
WESSON COMPANY, DETROIT, MICHIGAN
(Formerly Stanley)
WESSON
Carbide Cutting Tools
The name to rely on . . . no matter how tough the metal
for special or standard jobs . . . single or multiple setups

FUTURE STARS: Looking ahead, American industry sees countless stars of peacetime production . . . better homes, better equipped; better refrigerators, laundry and kitchen equipment, vacuum cleaners . . . better autos, trucks, tractors, farm and factory machinery . . . made possible, in part, by WESSON Carbide Cutting Tools . . . helping produce new products made from modern metals, tougher, more durable . . . produced faster, at less cost.



LYNN HEAVY DUTY, Self-Indexing **BED TURRET** and CUT-OFF CROSS SLIDE

Engineered as Finely as the Finest Turret Lathe

To convert your bench lathes for precision screw machine work at mass production SPEED—***you can trust LYNN Equipment!*** Quickly pays for itself. Saves big investment in turret lathes. Sturdy, rigidly accurate, versatile—it's so simple in operation that less skilled help quickly learn to handle it with ease.

THE LYNN BED TURRET fits standard bench lathes up to 13" swing. Six positions, automatic index, easy lever action, 6-inch head, 5½ inch travel, stops for each position. Furnished with ¾" holes designed to bore out to 1" on your own lathe. Cut-off cross-slide has two tool posts with adjustable jacks; handles recessing, forming, cut-off and similar work.

LYNN TOOL POST TURRETS—Self-indexing. For lathes with 12" to 28" swing. Holds 4 tools; indexes to 8 positions. Two indexing pins; tapered inserts. No cams to wear. Solid steel blocks —sizes 5¼", 6½", 8".

PROMPT SHIPMENTS — WRITE FOR FULL DETAILS

LYNN MFG. CO. • 218 Elroy St., Minneapolis 8, Minn.

PLAN FOR TODAY AND TOMORROW

WITH T-J FOR

Tough Jobs!

● Men responsible for *efficient production* in all types of industrial plants for a quarter century . . . have found T-J products "tops" for Tough Jobs!

Whether it's a job for Rivitors . . . hydraulic cylinders . . . air cylinders . . . cutters . . . Clinchors . . . or air controls . . . you can count on T-J for unbeatable efficiency, accuracy and dependable performance! All T-J products built to precise standards of manufacture . . . rigidly inspected . . . backed by practical-minded experienced engineering. In planning a better production set-up for better products . . . specify T-J Quality! Write for bulletins. The Tomkins-Johnson Co., Jackson, Mich.

T-J

TOMKINS-JOHNSON

RIVITORS...AIR AND HYDRAULIC CYLINDERS...CUTTERS...CLINCHORS

INDEX MILLS

...Are at home in the production line where they are installed in batteries making munition parts 24 hours a day, as well as in the tool room on precision work where they were originally intended.

Manufactured by
Index Machine & Tool Co.
Jackson, Michigan

★ MILLING

WITH END MILLS ⅛" TO ¾" IN TOOL STEEL

★ DRILLING

TO ACCURATE LOCATION

★ BORING

HOLES UP TO 3½" DIAMETER IN STEEL

Equipped with swivel head for working angles. Power feed to spindle for boring. Verniers for locating.

RODS & INDICATORS

NOW OPTIONAL AT NOMINAL COST

Immediate Delivery!

. . . on receipt of proper priority certificate (PD1-A or PD-3A).

Write to Factory Sales and Distributing Agents for complete catalogue.

BLANK & BUXTON MACHINERY CO.

3100 E. MICHIGAN AVE.
JACKSON, MICHIGAN

NOW! FASTCUT TOOLS ARE PLUS HARDENED

The Extra Layer Doubles the Wear

A Tool Crib Set

That will save you time and money by purchasing a complete set of sizes. The right size when you need it. Avoid costly delay by not having the right tool at the right time.

Complete Set

All standard in 41 sizes from No. 201 to letter G contained in a sturdy constructed hard wood box especially designed for this purpose.

PRICE
$111.50
NET

Immediate Delivery

No extra cost for specially designed hard wood box.

Shipping weight 9 lbs.

NEW SPIRAL CUT

Sold only thru mill supply and jobbing trade. Territories open. Information on request.

By actual experience the new **Plus Hardened** Hi-Speed Fastcut combination drills and countersinks has performed 3½ times as long, doing the same job under the same conditions, where an ordinary high speed tool was used before.

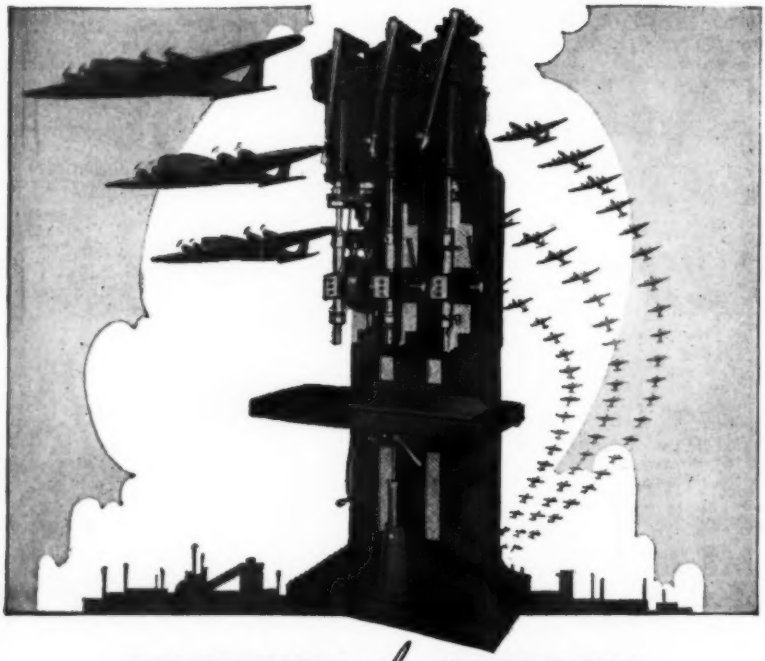
We specialize in making other than standard in both combined drills and key-seat cutters. Forward us your prints; you will be pleased with our fast efficient service.

Fastcut **Plus Hardened** Hi-Speed key-way cutters are now packed in complete sets in a specially designed case. Write for circular and discounts.

GOOD DELIVERIES

Fastcut TOOL COMPANY

2526 Hilton Rd.
FERNDALE, MICH.



ENROUTE *to* VICTORY

. . . Right—that's where we are heading; that's why it's important to make sure we leave no stone unturned to speed that journey. Our Avey MA-6 will maintain your high production levels. Built in No. 2 (capacity in cast iron, 7/8") and No. 2 (capacity in cast iron, 1¼") sizes. One to six spindle units, either size. Six speed machine, two speed motor with three mechanical changes through gearing. Speed range is eight to one. Push button control. The above photograph shows the MA-6 equipped with three spindles, the Aveymatic Feed, Hand Feed, Tapper.

Famous for their versatility, this is a Standard type Avey Drilling Machine.

ARMY E NAVY

THE AVEY DRILLING MACHINE CO.

Cincinnati, Ohio, U. S. A.

Avey DRILLING MACHINES

CINCINNATI, OHIO

Midget in Size with **GIANT POWER**

A full ¼-inch capacity drill (illustrated) weighing only 1 lb. 9 oz. is one of the latest additions to the ARO line.

ARO PNEUMATIC TOOLS

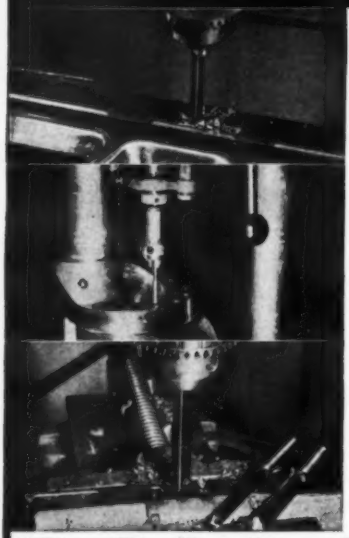
● Break through "bottlenecks" in your small tool operations... by installing ARO Pneumatic Tools! With tremendous power in a surprisingly small unit, ARO gets small tool jobs done *efficiently* and *fast!* Reduces fatigue, too!

The ARO line of small pneumatic tools is especially easy-to-handle for women operators... for drilling, nut-setting, screw-driving, grinding, and countless other jobs. Simple in design... rugged... dependable... stall-proof. Ask ARO Field Engineers to help solve your special tool problems and the adaption of standard tools to your operations. Write for catalog.

The Aro Equipment Corporation, Bryan, Ohio.

PNEUMATIC ARO TOOLS
THE ARO EQUIP. CORP.
BRYAN, OHIO

A Vital Aid to PARTS RECOVERY— "HARDSTEEL" DRILLS



SAVES DIES. On a crimping die for making aluminum mess trays for the Navy, the diemaker forgot to drill for the gage pins before final hardening. On the stamping die he neglected to drill a vent hole before the die was hardened. All holes were drilled after hardening with "HARDSTEEL" drills and two expensive dies were saved.

SAVES MACHINED PARTS. "HARDSTEEL" drills are now regularly used to remove broken taps in blind holes in Wright engine crankshafts without defacing the threads. This method requires only 2 to 2½ hours—saves 6 hours compared with the former grinding method and results in 100% parts recovery. Hardness of the taps is Rockwell "C" 60-65.

SAVES TOOLS. This big broach broke through the slot while in service. It was full high-speed steel—yet with "HARDSTEEL" drills it was found possible to drill three half-inch holes through the shank and the broach was quickly placed back in service.

"You Harden It . . . We'll Drill It"

Parts recovery saves labor costs, machine costs and critical material. Having "HARDSTEEL" drills on hand for emergencies may mean the difference between meeting a production quota and falling behind.

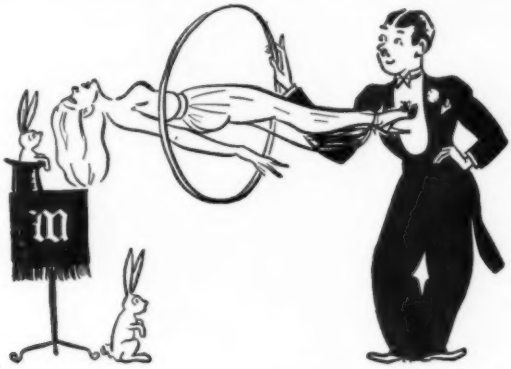
No charge for "HARDSTEEL" Operator's Manual telling how to drill steels hardened by any process.

BLACK DRILL CO., 1400 East 222nd Street, Cleveland 17, Ohio

"HARDSTEEL"

DRILLS · REAMERS · TOOL BITS · SPECIAL TOOLS

It's No Trick At All With TORIT



TORIT DUST COLLECTORS

make the collecting of abrasive dust particles a simple matter. Portable and completely self-contained they are easily attached to existing machinery and, when necessary, they can be moved about to fit into new production layouts.

Torit Dust Collectors trap grinding dusts at their source and the cleaned air is re-circulated into the room . . . saving employes' health, valuable machinery and reducing heating bills. For complete information write:

TORIT MANUFACTURING CO.
303 Walnut St. St. Paul 2, Minn.

TORIT Dust Collectors
SELF-CONTAINED UNITS

1200 HORSEPOWER Rides On 6 MILLIONTHS of an inch

An army travels on its stomach, but our bombers and fighters do literally fly on their bearings. Aircraft master rod bearings, therefore, are tremendously important . . . failure must not occur . . . consequently specifications are rigid, so rigid that finishing presented a pressing wartime problem to the manufacturer.

Surface finish was of primary importance — was vital for bearings to stand up continuously under the merciless buffeting of 1200 and more whirlwind horsepower. Six microinches, the specifications called for, six millionths of an inch. Design, too, specified a very difficult contour bearing surface, with tapers at either end and a straight section between. And accuracy also had to be close, to .0002".

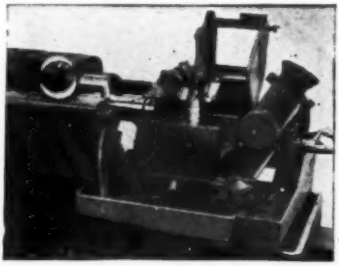
HEALD ENGINEERING was called in . . . and solved the problem. This was a special Heald Bore-Matic arranged with a cam operated contour boring head for boring straight and tapers in a single uninterrupted cut . . . with ingenious refinements in machine design which so completely reduced vibration and thermal expansion that ultra finishes of 4-6 microinches could be produced. Today, a total of 19 Heald Bore-Matics are in production on these bearings in one plant alone.

Have you a wartime problem or do you need assistance in post-war planning? If it involves precision finishing, HEALD ENGINEERING is available, now, to help you.

The HEALD Machine Co., Worcester Mass., U. S. A.

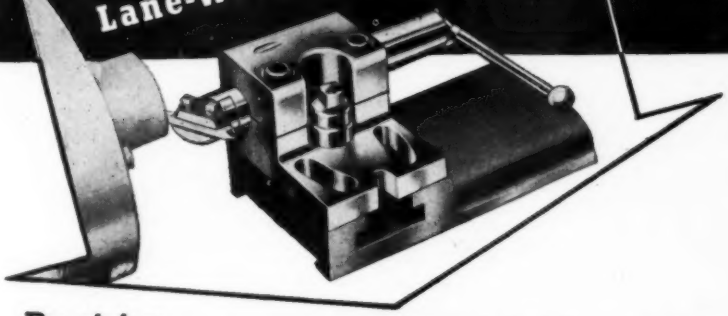
Silver bearings of this type have done much to keep aircraft flying longer, fighting longer. For ultra precision, bearings are borized — to .0002" accuracy, 6 microinches finish.

Precision plus production in finishing aircraft bearings were both achieved with the development of the specially arranged Heald No. 47A Bore-Matic shown below. Machine features include a special contour boring head for boring straight and taper bearing surfaces in the same cut; many design refinements for obtaining surface precision of 4-6 microinches. The Bore-Matic handles both full round and split bearings.



For More Precision Faster, bring your problems to Heald

5-SECOND TOOL CHANGES!
Lane-Wells Tool Holder



Precision
BORING

FORMING

FACING

TURNING

MATCHES "TURRET LATHE" SPEED AND ACCURACY

Your engine lathe can be made to equal turret lathe speed, accuracy, precision, and *production* with Lane-Wells Tool Holder. By reducing tool-changing time to less than five seconds and enabling the operator to take all readings from the cross-feed dials, this simple, rugged Tool Holder saves as much as ⅓ of machining costs on identical pieces. Built in sizes for all standard engine lathes from 9" to 36" swing.

Send for Bulletin

LANE-WELLS COMPANY
Engineers and Manufacturers
5610 South Soto Street • Los Angeles 11, California

WHEN IT'S *Versatility* YOU WANT!

HC-5

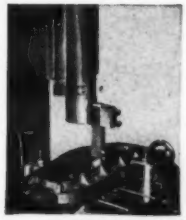
●Grinding—Sanding—Rotary filing—Polishing—Wire brushing—Drilling—many other operations—all done with one Haskins Flexible Shaft Machine. And done better, too—and faster. This is no single operation machine. In every metal working plant, machine shop, foundry and die shop, there's no end of jobs for Haskins Equipment. Get the most from *your* man-hours. Write for Catalog 45, showing many ways to speed production with flexible shaft equipment.

R. G. Haskins Company, 623 So. California Ave., Chicago, Ill.

HASKINS
Flexible Shaft
EQUIPMENT

DOUGLAS *Precision* MACHINES

The Douglas Precision Slotter is adaptable to both tool room and production work. Swiveling ram head with tool holder and rotary table often solves the problem of costly fixtures. Automatic feeds in all directions — 7" to 10" stroke.



Typical production parts machined on a Douglas Slotter.

FOR TOOL ROOM AND PRODUCTION

Prompt Delivery to War Plants

The Rotorex Universal Tool and Cutter Grinder will accurately perform all kinds of tool grinding operations. Readily interchangeable attachments are available to set up machine for single-purpose jobs such as cylindrical, internal and radius grinding.

Operation showing set-up for internal grinding.

Operation showing set-up for sharpening straight gash hobs.

DOUGLAS MACHINERY CO., Inc.

150 BROADWAY • NEW YORK, N. Y.

SPEED-UP WAR PRODUCTION JOBS

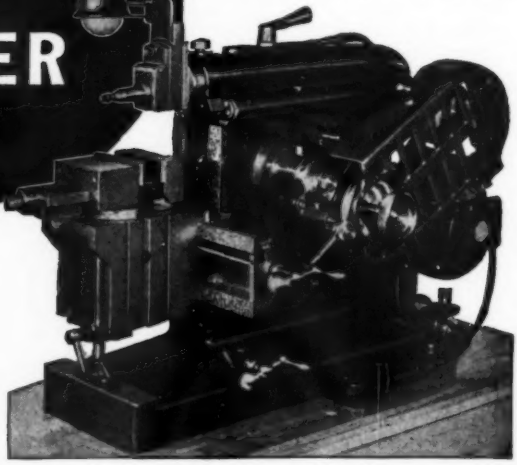
with this precision machine of a thousand uses

★

IT'S PORTABLE

--Saves Steps and Time

AMMCO 7" SHAPER



Just wheel up to bench - - plug in - - go to work!

On jobs requiring a stroke of 7" or less, the AMMCO 7" PRECISION SHAPER will enable you to save a lot of time and expense in a set-up which would be required for larger shapers. Furthermore, the AMMCO will enable you to get away from the cost of operating a big shaper on small work.

Portable Cabinet, as shown above at left, available as optional equipment, enables this shaper to be moved about the shop. It can be rolled from one job to another, and can be brought right up to machine or bench where man is working...Write today for specifications and prices.

AUTOMOTIVE MAINTENANCE MACHINERY CO.
2100 Commonwealth Ave.—North Chicago, Illinois, U. S. A.

3 BUILT-IN SUCCESS FACTORS

WHEELS for Cylindrical Grinding

1. Fractional Grades

Three degrees of hardness in a single grade, offering a wider range for a more accurate wheel selection.

2. Controlled Porosity

Manufacturing control over the size and distribution of pore spaces between the abrasive grains, assuring wheel duplication.

3. H9 Vitrified Bond

An improved wheel bond, assuring cooler cutting, longer life, increased production rate, lower operating costs.

BAY STATE ABRASIVE PRODUCTS CO.
WESTBORO, MASSACHUSETTS

Turning AND *Centering*

IN **1** OPERATION

With R and L Tools

This Combination Tool is the only Right and Left Hand tool on the market. Can be changed from right to left and vice versa in 10 seconds. Replaces 14 tools costing 4 times as much.

Here are some of the multiple operations that can be done with the R and L: Pointing work concentric with turned diameter; drilling and chamfering; turning and forming special shape or end of part while drilling or reaming; turning one diameter—chamfering two corners, facing end of part along with drilling or reaming; turning two diameters while drilling or reaming; turning shoulder concentric with stock diameter.

You can readily see the enormous savings in time, trouble and money that can be effected by the use of R and L Turning Tools.

Write for 44-page booklet describing all the uses of R and L.

R AND L TOOLS

1827 BRISTOL ST. NICETOWN, PHILADELPHIA, PA.

AMAZING! UNBELIEVABLE! INCONCEIVABLE!

GET DIAMOND BORING MACHINE RESULTS FROM YOUR LATHE FOR $10

This amazing, utterly different tool cuts with a shear-cut action (as proven by the curled chip) and leaves a mirror finish. Will not dig in or chatter—gives absolutely accurate holes and usually eliminates reaming, grinding, and diamond boring.

10 to 30 new sharp cutting edges on the circular bit without grinding or changing set-up. Grinding time saved pays for cost of tool before regrinding is necessary (and then grinding time takes only one minute).

Save Time, Money, Material and increase production with the unconditionally guaranteed Shearcutter Boring Bit. Eliminates reaming, honing, and grinding. Invented by one of America's greatest tool designers. Send order today with priority rating. Watch for new Amazing Shear-cut Tools! *Distributors wanted.*

$10 ...includes tool holder and two Shearcutter Bits

SHEARCUT TOOL CO.
Dept. BB-12
19600 Sherman Way
Reseda, California

"An EYE for *Exactness*"

Special lamps for blacklight illumination of warplane instrument panels must be flawless. During manufacture, they are inspected under a Stanley "Flud-Lite" Magnifier at the Danvers Fluorescent Lamp Plant of Sylvania Electric Products, Inc.

STANLEY "FLUD-LITE" MAGNIFIERS

The crystal-clear five-inch lens and directed fluorescent light of Stanley "Flud-Lite" Magnifiers provide a never-tiring "eye" that guards against production errors and eyestrain.

Ample magnification and glare-free light enable inspectors and machine operators to see the tiniest flaws and scratches in machined parts quickly, detect dimensional errors, check reamers, gauges, dies, etc., to perfection.

Write for catalog sheets. Stanley Electric Tool Division, The StanleyWorks, New Britain, Conn.

STANLEY
Trade Mark

STANLEY ELECTRIC TOOLS

THE Bridgeport TURRET MILLING MACHINE

Rigidity and Flexibility Unparalleled Range

The most difficult milling, drilling and boring jobs are easy with the new Bridgeport. Here are a few of the advanced modern features that make such performance possible.

Angular settings in one plane are achieved by turning the hand wheel which controls the keyed overarm. Turret diameter is 15" with 5" overarm.

Column, knee and table construction are rugged with wide ways and taper gibs for accurate and vibrationless operation. Table, knee and saddle locks are located in front for easy accessibility.

Graduated dials are 3¼" in diameter. Anti-friction bearings are used throughout.

Write for full details.

BRIDGEPORT MACHINES, INC.

52 REMER ST. BRIDGEPORT, CONN.

EASTERN'S TOOLCRIB OFFERS FOR

Immediate Delivery

QUALITY DIAMONDS
For Defense

We can supply you with EASTERN Quality Diamonds, known for their dependability, at the following attractive PRICES:

¼	c't.	$ 2.95
½	"	3.95
¾	"	7.00
1	"	8.95
2	"	15.00
3	"	25.00
4	"	35.00

These Diamonds can be supplied in any special holder or nib at the same price.

TURN HEAVIER LOADS FASTER with

IDEAL LIVE CENTERS

Get more work, quicker, out of lathe, millers, grinders, etc., with ETSCO Live Centers. They rotate with the work, and therefore permit heavier loads—faster speed — deeper cuts. The radial load is carried by a high precision ball bearing, and thrust load absorbed by a taper roller bearing. All parts are hardened and ground.

TRIPLE DUTY

Three interchangeable center pieces (illustrated above) for all kinds of centered and uncentered work Saves set-up time. Extra charge.

Center No.	Morse Taper No.	Cap. 100 r.p.m. Rad. and Thrust	Net Price
1—MA	1	250 lbs.	$20.00
2—MA	2	250 lbs.	20.00
3—MA	3	250 lbs.	20.00
3—MB	3	400 lbs.	25.00
4—MB	4	400 lbs.	25.00
4—MC	4	600 lbs.	35.00
5—MC	5	600 lbs.	35.00
1½—SC	Straight	600 lbs.	35.00
1¾—SC	Straight	600 lbs.	35.00

Send for our Catalogue

EASTERN TOOL SUPPLY CO.

176 GRAND ST. NEW YORK 13, N. Y.

HERE'S YOUR ANSWER TO

Accurate Radii —

• The form produced by a radius dresser is only as accurate as the diamond used to dress that radius form. It is because Wheel Trueing engineers know this—because they know the importance of extreme accuracy and precision in radius forming operations that the diamonds used in Wheel Trueing Radius Forming Tools are selected with the greatest care according to the particular radius each is to dress.

But careful selection of diamonds alone is not enough! The diamonds in these tools are set by experts who make certain that each diamond is concentric with the shank. And throughout the various manufacturing operations, these tools are subjected to rigid tests and careful inspections by men whose skill, experience and engineering knowledge cover the fields of industrial diamonds and grinding wheels. These men know diamonds! They know the production man's problems! They know how to design and manufacture tools to solve those problems!

Next time you buy radius forming diamond tools specify Wheel Trueing. You'll be assured of utmost precision, accuracy, dependable performance and money-saving economy. You'll get radius forming tools *engineered to your jobs!*

Other Wheel Trueing products include diamond tools for straight or form dressing—thread dressing—contact gauges—and drill bits for coring or blasting.

WHEEL TRUEING TOOL COMPANY

3200 W. Davison Ave. Detroit 6, Michigan

for QUICK change-overs

$197.50
Immediate Delivery

UTILITY TOOLS

In a matter of minutes you can convert your engine lathes into screw machines. Simply remove tail stock and install a Utility Turret and Crossfeed Cut-off. Turret has rack and pinion which assures steady feed. Raised bearing surface eliminates all chip trouble. Has two taper gibs for take-up and alignment. All ways and bearing surfaces are ground. All inserts, bushings and pins are hardened and ground. Hex is 5⅛" across flat, 2-7/16" thick. Accommodates a ¾" hole or a No. 1 or 2 Morse taper. Fits Logan, South Bend, Atlas, Craftsman, 10" Sheldon, Clausing, etc.

Cross Slide pictured here has rack and pinion, two tool holders with adjustable jacks. Weight approximately 40 lbs.

Collet Closer parts are hardened and ground. Full ball bearing. Only wear is on ball bearings. Write for detailed literature and prices.

$55.00

$60.60

UTILITY TOOL and DIE MFRS.

1370 West Washington Blvd.
LOS ANGELES 7, CALIFORNIA

"Tenths" Are Here to Stay

There are shops today working to tolerances of tenths of thousandths that formerly considered 1/1000" a close measurement. The precision demands of war have made these tolerances a commonplace.

For this reason, because 1/10000" is being called for more and more, REED micrometers in the 1", 2" and 3" sizes will now be manufactured with 1/10000" vernier only AT NO EXTRA CHARGE. Even now micrometers reading to "thousandths" are often inadequate and may well become obsolete.

If you are working with micrometers reading to 1/1000" only, this is your opportunity to order a REED No. 901, as shown above, with vernier to 1/10000" for only $8.50 less 10%. The price is low but the quality is high. REED MICROMETERS HAVE BEEN MADE IN THE U. S. A. CONTINUOUSLY FOR 30 YEARS.

We have just published an 8-page folder about REED micrometers that you should have. Every man who uses a "mike" will find it of interest.

Write or telephone for this folder NOW!

HOW TO INCREASE UNIT PRODUCTION

with Specialties lathe accessories

More than double your unit production with these three lathe accessories. Rough and finish turn or bore, drill, tap, etc., without stopping the lathe or changing tools. Mail coupon for full details, including special adapters for complete range of machining set-ups.

Lathe Stop saves time. Once the four measuring positions are set, it is only necessary to index. Spring pin automatically centers and locks the spacer arm.

Cross-Slide Turret enables multiple machining operations, giving 4 working positions from the cross slide. No time lost stopping to change tools. Ties up only one lathe instead of four. Easy to attach. Simple to operate.

Tail-Stock Turret quickly converts your engine lathe into a 4-way turret for end-work. Cuts machining costs sharply. Increases unit production.

SPECIALTIES MANUFACTURING CO., INC.

SPECIALTIES Manufacturing Co., Inc.
26 Farrand Street, Bloomfield, N. J.

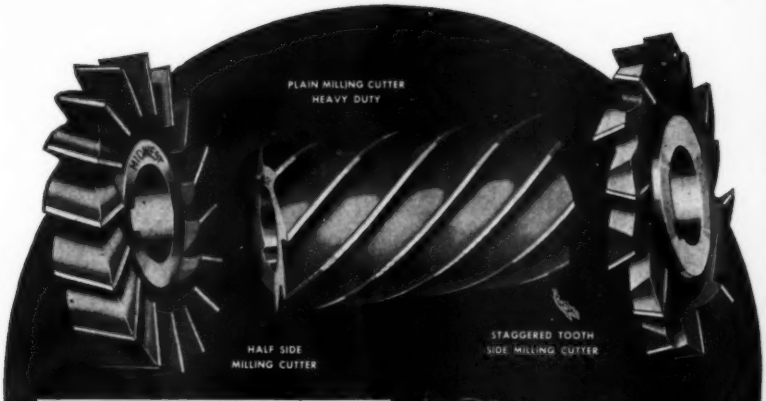
Please send me full information on SPECIALTIES lathe accessories.

Name_____

Company_____

Address_____

City_____ State_____



MIDWEST MILLING CUTTERS

AND HOW BEST TO USE THEM

HEAVY DUTY PLAIN MILLING CUTTERS—This type of cutter is recommended where there is heavy production milling of materials in soft or alloy steel, bronze or copper. They have coarse pitch, undercut teeth with maximum backing behind cutting edges and ample chip space.

Midwest standard heavy duty mills have a smooth cutting action; they set up an end thrust which keeps the spindle tight in its bearings and eliminates chatter because they are made with 45° left-hand spiral teeth.

HALF SIDE MILLING CUTTERS—a type for heavy-duty straddle milling operations where only one side of the cutter is required for milling; also used frequently in pairs to mill a slot to fixed width but where finish at bottom is not important.

These mills have spiral, undercut teeth which provide particularly free-cutting action. Compared with side milling cutters, these half side mills show lower power consumption, more pieces per grind, and less idle machine time due to cutter changes.

STAGGERED TOOTH SIDE MILLING CUTTERS—This type of mill is exceptionally free cutting. For that reason it is ideal for deep slotting or the milling of keyways. The top teeth are undercut and have an alternate right and left-hand helix angle, which greatly reduces end thrust.

Since drag ends (inefficient tooth portions) are eliminated, increased chip room is obtained, and chip lengths are broken up, giving them the characteristic snap out of the cut. The sides of the teeth having no cutting action are "dished" slightly toward the recessed part of the cutter and this eliminates "bugging" of the cutter sides and, in turn, scoring the sides of the slot.

Many other types and forms of metal cutting tools are made by Midwest; catalog No. 17 contains illustrations and extensive information on them.

Any metal cutting problem inquiry you make will be carefully studied and analyzed. Suggestions and recommendations will be returned to you on types of tools to employ and how best to use them—a Midwest service entering its 31st year.

MIDWEST TOOL & MFG. CO.
2362 W. Jefferson Ave. Detroit, Mich.

MIDWEST

END MILLS • SLEEVES • COUNTERBORES • DRILLS
SPECIAL TOOLS • REAMERS • FORM TOOLS
CARBIDE TIPPED TOOLS • ADJUSTABLE HOLDERS

Precision METAL CUTTING TOOLS

"Hi DRAULIC, how's your pressure?"

Limber as a Lariat
STRONG as STEEL!

"....Well, it's a lot better since I got hooked up with Norgren Hose Assemblies. They're *Limber as a Lariat; Strong as Steel!*" Synthetic! Resistant to oils and grease, heat, cold and vibration. Their machined couplings are on to stay. They'll go to any lengths for dependability, too.

Send I. D., overall length, and thread requirements for estimate. C. A. Norgren Co., 220 Santa Fe Drive, Denver 9, Colo.

Norgren

HAND CUT
OR GROUND

80 YEARS OF "KNOW HOW"

BEHIND EVERY PRATT & WHITNEY BUR AND ROTARY FILE

You receive a lot more than just burs — or just rotary files — when you order the Pratt & Whitney kind.

For more than 80-years — all over the world — the name of Pratt & Whitney on machine tools and metal cutting tools has been the buyer's assurance of advanced design, precision workmanship, highest quality materials, and top metallurgical standards.

This long backlog of experience in all manner of metal cutting problems naturally finds its way into the design, production, and heat treatment of the burs and rotary files produced by our Kellerflex Division.

In war plants all over the nation, night and day, Pratt & Whitney Keller Burs and Rotary Files are biting into castings, forgings, all sorts of tough metals — as Pratt & Whitney cutting tools have done for more than three-quarters of a century.

For your next order of burs or rotary files — try Pratt & Whitney. You will be well satisfied with the extra value in Pratt & Whitney-made Keller Burs.

PRATT & WHITNEY
Division NILES-BEMENT-POND COMPANY
KELLERFLEX SALES DIVISION
WEST HARTFORD, CONN.

BE ACCURATE!

... use CHALLENGE
Semi-Steel BENCH PLATES

Provide an accurate, rigid surface for inspection, layout and assembly. Depend on Challenge Bench Plates—made of special analysis semi-steel—all sides machined at right angles to the top. Precision ground—two, four, and six inches thick—wide range of sizes. Also available in planer finish. All plates have heavy ribs on the underside. Send for latest Challenge catalog containing complete information.

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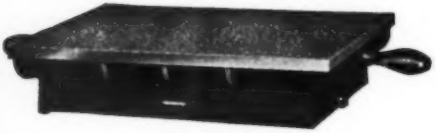


CHALLENGE
SEMI-STEEL
SURFACE PLATES

A precision surface for tool making and inspection. Used as master plates for testing and checking purposes. Made of strong, close-grained semi-steel, specially treated to overcome strains in casting and machining and to avoid distortion after scraping. These plates have three-point suspension and heavy, deep ribs on the underside to form triangular supports. Hand-scraped or precision ground. Felt-lined wooden protective cover furnished with each plate. Write today for full details, including list of sizes and latest prices. 431

Challenge

THE CHALLENGE MACHINERY CO.
GRAND HAVEN, MICHIGAN, U.S.A.

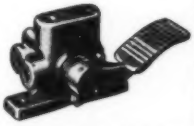
NOPAK Air Cylinder Provides Pneumatic Power for Beading Press

Beading Time Cut 95%

. . . in Rohr Tubing Department

A novel tube-beading press has been developed at the Rohr Aircraft Plant, which puts a bead on chrome or monel tubing in 2 to 3 seconds; 20 times faster than previous methods!

The heart of this press is its unique die-assembly which works like the collet in a screw machine. An expansible rubber inner die, inserted in the tube end, is pulled into a 4-section metal outer die. The expansion forces the metal into the beading cavity of the outer die. Dies for various tube sizes can be changed in 10 seconds or less.



NOPAK Cylinders are at their best when controlled by NOPAK 2-, 3- and 4-Way Valves —Hand, Foot or Solenoid Operated.

Dependable pulling power for this fast-working press is furnished by a Standard NOPAK Model "A" 12" Air Cylinder, controlled by a foot valve. Turning out "beads" at the rate of 20 to 30 per minute establishes NOPAK Cylinders as a dependable source of pneumatic power for continuous high-speed production operations. Ask for Cylinder Bulletin 82-A.

GALLAND-HENNING MFG. CO.
2754 SOUTH 31st STREET • MILWAUKEE 7, WISCONSIN

Representatives in Principal Cities

NOPAK VALVES and CYLINDERS
DESIGNED for AIR or HYDRAULIC SERVICE

GENESEE ADJUSTABLE HOLLOW MILLS

(Standard Style H)
Facing & Counterboring
Tool

Cut Cost – Increase Production

with GENESEE inserted blade—

ADJUSTABLE HOLLOW MILLS
FACING & COUNTERBORING TOOLS
SPECIAL PRODUCTION TOOLS

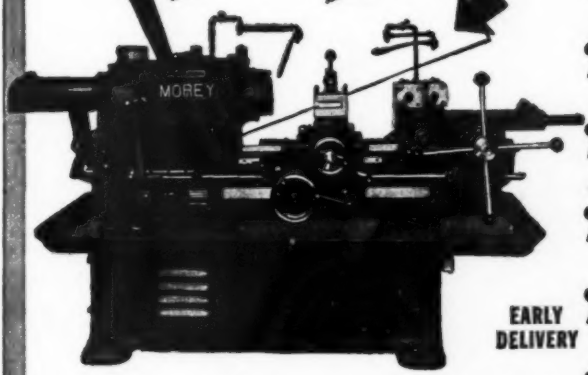
Backed by 35 years experience our Engineering Department is always ready to serve you in your Production Tool problems.

Write for complete Catalog No. 42-J

GENESEE
MANUFACTURING CO., Inc.
ROCHESTER 4, N. Y.

MOREY TURRET LATHES
for BAR or CHUCKING UNIVERSAL or PLAIN

#3 UNIVERSAL
For bar stock up to 1½" in diameter
18" turning length
10½" swing over bed
Infinite spindle speeds 35 to 1800 RPM, constant speed motor. 1200 RPM.
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A



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- INFINITE SPINDLE SPEEDS —Electrically Selected—
- DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (patents applied for).
- GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.
- SPINDLE MOUNTED ON TIMKEN BEARINGS.
- RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS *MODERN* TOOLS WILL WITHSTAND.
- SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.
- BED MOUNTED ON CABINET BASE.
- MOTORS AND STARTING EQUIPMENT EASILY ACCESSIBLE.
- HEXAGON TURRET AUTOMATICALLY UNCLAMPED, INDEXED AND CLAMPED.
- THREE TYPES OF CROSS SLIDES AVAILABLE:
  Lever Feed
  Screw Feed
  Combination Feed*
  *Combination feed provides instantaneous selection to either lever or screw feed.
- EIGHT (8) FEED CHANGES FOR THE UNIVERSAL CARRIAGE and HEXAGON TURRET, INSTANTLY ENGAGED OR DISENGAGED BY ONE MOVEMENT OF THE LEVER.

#2 PLAIN-GEARED
For bar stock up to 1" in diameter
Turning length 8½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
Ask for Circular 628A

#4 UNIVERSAL
For bar stock up to 3" in diameter
13" turning length
18½" swing over bed
Infinite spindle speeds 35 to 1500 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 730A

ARMY E NAVY

THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

DESIGNED AND BUILT BY
MOREY MACHINERY CO., INC
410 BROOME STREET NEW YORK N. Y. ... 2-17-76th St. BUTLER NEW YORK

BUILT by PERFECTIONISTS

for Exacting Operations!

The Famous
GRUMMAN HELLCAT

Circle R Saws and Grumman Hellcat fighters have this in common; both are made by perfectionists to accomplish today's difficult and exacting tasks.

CIRCULAR TOOL CO., Inc.

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Tomorrow's equipment for TODAY!
HANSEN
INDUSTRIAL AIR LINE
EQUIPMENT
In Hansen equipment you get advanced engineering, modern design and quality materials to meet the demands of today and tomorrow—SPEED, PRODUCTION, EFFICIENCY and ECONOMY.
For the past quarter of a century, Hansen Air Line Equipment has been the outstanding quality line, never built down to meet a price but always maintained at a high quality level.
THE HANSEN MFG. CO.
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SAND BLAST CLEANERS
AIR-LIQUID SPRAY GUNS
BLOW GUNS
HOSE CLAMP SOCKETS
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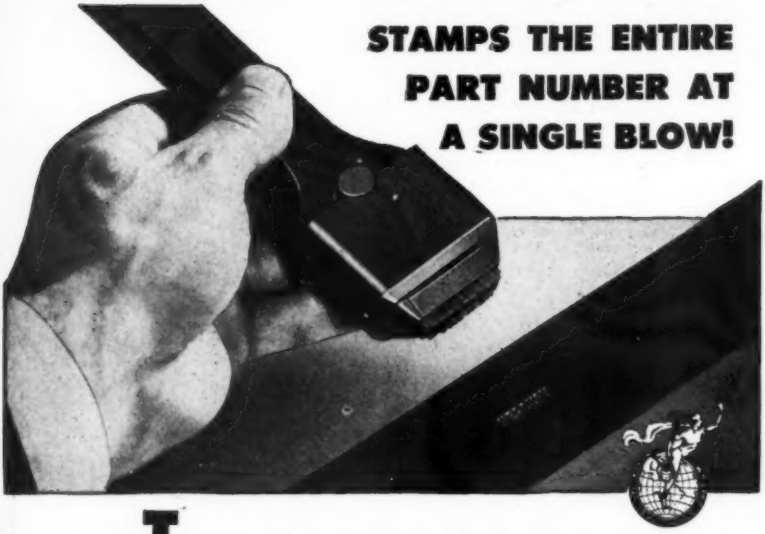
HOSE CLAMPS
HOSE CLAMP PLUGS
Send for Free
CATALOG

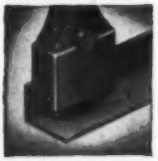
STAMPS THE ENTIRE PART NUMBER AT A SINGLE BLOW!



THIS MERCURY TYPE HOLDER is the efficient solution to the *accurate* numbering of parts, *vitally* important in today's war production programs . . .

It stamps the *entire* part number—up to 16 characters if needed—with just one blow of the hammer. One setting of the part number in the Holder enables you to mark as many duplicate parts as desired—quickly, accurately and neatly. It eliminates inefficiency and time lost using single-character stamps for each separate figure or letter, and all of the errors common to this method such as overlapping, wrong sequence, etc.

In addition, Mercury Type Holders offer you these outstanding features that insure faster, better stamping operations . . .



Interchangeable Type—Changing type is a matter of seconds and involves no special knowledge or equipment.

Fool-proof Operation—Special design features make it impossible to incorrectly place type in Holder.

Compact Construction—Smaller parts can be neatly numbered because of unusually compact Holder construction.

Durable, Trouble-Free—All steel *machined* construction eliminates replacements and repairs.

Available complete with hardened and ground hand-cut steel type in all popular sizes and in special models to meet specific problems. Descriptive folder—mailed free—gives details and specifications for both hand and press style Holders. Write Dept. 98 for your copy

MERCURY METAL DIE & LETTER CO., INC.

546 E. 16TH ST., LOS ANGELES 15, CALIFORNIA

CUTTING THE TOUGHEST JOBS ON *EVERY* TYPE OF ARMAMENT

SIEWEK-BUILT "PROGRESSIVE"
SHEAR-CUT END MILLS

Working hard to help make American armament the best and most powerful in the world, Progressive "Shear-Cut" End Mills are cutting clean, fast and long on the toughest jobs.

That's because they are precision made of the finest materials, to feed accurately, minimize chatter, give adequate chip clearance and uniform cutting action. Rigidly held, these End Mills will permit working to extremely close limits.

Progressive End Mills are now being manufactured by the Siewek Tool Division of Domestic Industries, Inc. . . . the same high character product, the same old family of skilled workers—plus the wider resources of Domestic Industries, Inc. for added manufacturing facilities and improved customer service.

Remember, the name "Progressive" has always and will continue, to signify "superior tools for superior work."

SIEWEK TOOL DIVISION
OF DOMESTIC INDUSTRIES, INC.
Detroit (Ferndale Station) Michigan
Designers and Builders of
JIGS, FIXTURES AND SPECIAL MACHINES

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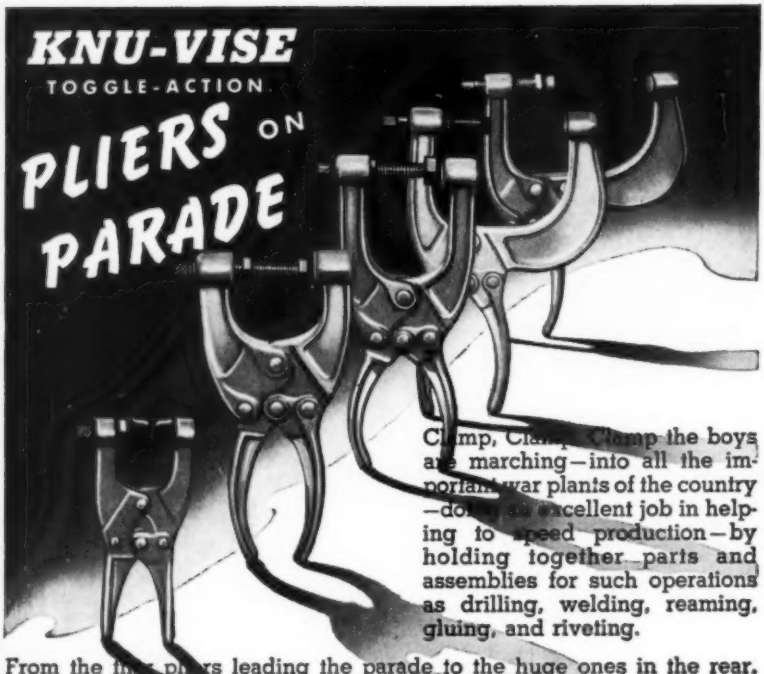
AFFILIATED WITH SIEWEK ENGINEERING DIVISION • CHICAGO • DETROIT • HARTFORD—a nationally known organization staffed with experienced engineers—Consulting, Processing, Designing, Fabricating and Efficiency Methods

KNU-VISE

TOGGLE-ACTION

PLIERS ON PARADE



Clamp, Clamp, Clamp the boys are marching—into all the important war plants of the country—doing an excellent job in helping to speed production—by holding together parts and assemblies for such operations as drilling, welding, reaming, gluing, and riveting.

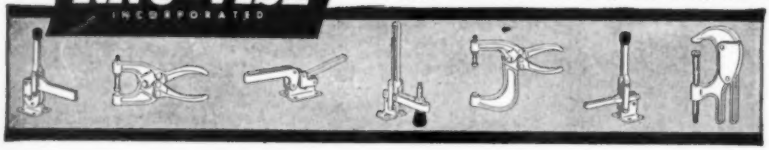
From the tiny pliers leading the parade to the huge ones in the rear, every pair is doing real service in war activity.

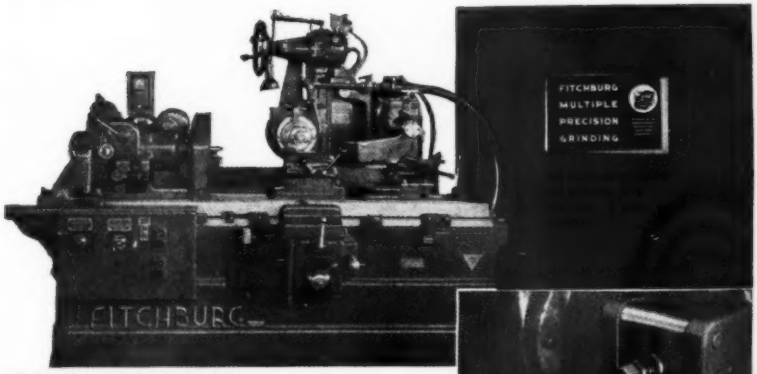
The small ones in front (4¾" long) hold airplane wings for multiple drilling operations. The next two models hold parts during welding, and the next two—with their deep throats—serve to hold angle irons and channel sections and other odd shapes in other war plants.

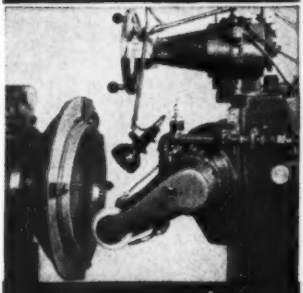
Whatever your clamping problem, Knu-Vise has a clamp that will meet your particular need and increase your production. Send for our catalog describing the entire line.

KNU-VISE
INCORPORATED

1334 Plum St., Detroit 16, Michigan
4326 San Fernando Rd., Glendale, Calif.







SPLINE GRINDING?
SPLINE SHAPING?
INTERNAL GEAR GRINDING?
EXTERNAL GEAR GRINDING?

.... Do all four on the Fitchburg Gear Grinder

A single Fitchburg Gear Grinder, with special attachments will

GRIND internal or external, helical or spur gears — straight, taper and helical splines, and will also

SHAPE straight, taper and helical splines.

A leading automobile manufacturing plant now engaged in making airplane engines, is using Fitchburg Gear Grinders with Special Wheelheads in the important operation of grinding internal gears. They give highest praise to its accuracy, fine finish and high production at low cost.

You can get the same results on a variety of work—on this one machine—why not let Fitchburg engineers show you how. Write today.

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U.S.A.

Manufacturers of—Bawgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Both Full Universal Grinders and Special Purpose Grinders.

Do these symbols mean anything to you?

They do... if you have a government contract to make ▬▬▬ (Censored).

▬▬▬ (Censored) is not a wishful weapon. It's real, and it requires precision finish which Egyptian understands completely.

TT-L-58 is a special clear spraying lacquer.

52-L-13 is a clear lacquer with an exceptional ability to mix with aluminum paint. We are probably the oldest clear lacquer people in the country. We know this product inside and out. We can provide the spec finishes for ▬▬▬ (Censored) with the usual Egyptian plus as to quality and application.

Finish problems simplified—that's our business in time of war or peace. For your post-war products you can always depend on Egyptian Finishes... yes, always.

★ ★ ★

Special correspondence on finishing problems is invited.

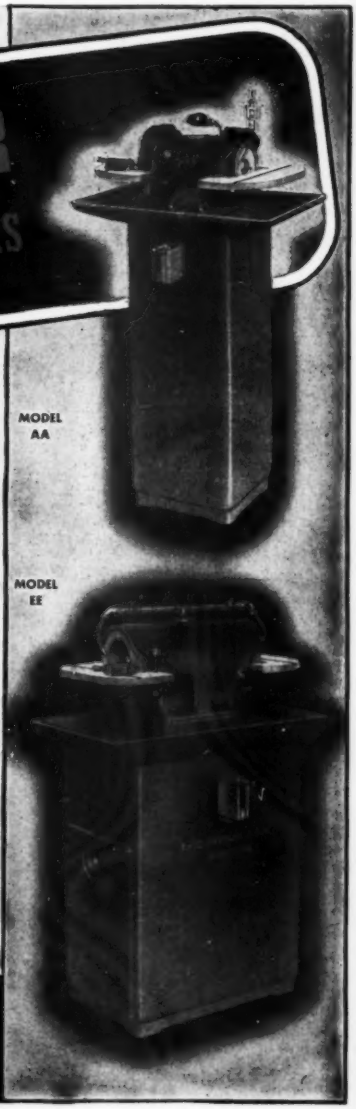
Egyptian's new U. S. Government "Spec" Book—4th Edition—is ready. It's helpful and it's FREE. Send for your copy. Please address Dept. R-1.

THE EGYPTIAN LACQUER MANUFACTURING COMPANY
ROCKEFELLER CENTER, NEW YORK 20, N. Y.

EGYPTIAN FINISHES

EGYPTIAN
SUPERIOR FINISHES

PROSSER
CARBIDE GRINDERS



● Modern, streamlined grinders for most rapid rough grinding and finest finishing of carbides, stellite, high speed steel, and other modern tools.
Bench and floor type machines, of several capacities, for wet or dry grinding, as desired. Attachments for chip breaker and drill grinding.

FEATURES OF PROSSER GRINDERS

- Quick-acting indexing tables.
- Adequate wet-grinding equipment.
- High grade ball bearing spindles.
- Oversize wheels, giving longer wheel life, and permitting grinding of larger tools.
- Moderate price.

Prompt Deliveries
Write for Details

Thomas Prosser & Son
120 WALL STREET • NEW YORK

The Collet that "Makes" Precision

Collapses 1/32 in.—Retains Gripping Strength and Accuracy.

Collet open at both ends.

PRINCIPLE

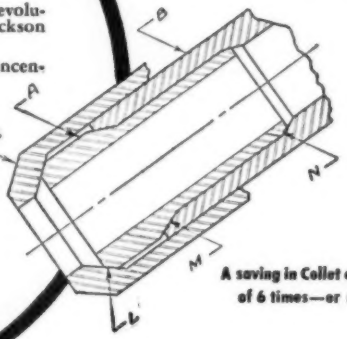
The drawing (right) illustrates the revolutionary principles embodied in the Erickson Precision Collet Chuck.

Collet "A" is automatically lined up concentrically with the axis of the Shank "B" by two Cam Surfaces of the Collet "M and N" mating with the Cam Surfaces of Shank. The Shank and Collet Cam Surfaces are mated to within .0001 inch.

This action aligns Collet with the Axis at the Center of Shank, allowing it to be drawn back by Collet Cam Surface "L" and Nose Piece "C".

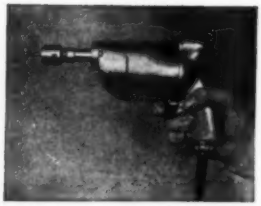
Due to the fact that collet is open slotted at both ends, Collet "A" then collapses equally throughout its length to maintain a vise-like grip and remain in perfect alignment with the Axis of Shank.

One ERICKSON COLLET will replace 7 standard, single purpose Collets.



A saving in Collet expense of 6 times—or more.

Model 402 Chuck in use on Automatic Screw Machine. Drill gripped on flutes.



Special Model 202 Chuck used in Hand Drills in Aircraft Industry. 01 Models are regularly recommended for Hand and Air Drills.

Model 201 used in drill press. Extra long drills can be used, by extending them from the chuck as they wear.

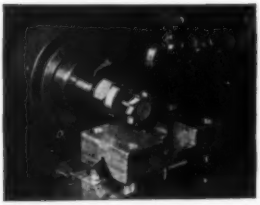
Send for Bulletin E giving complete information and additional photographs of uses

ERICKSON STEEL COMPANY

The ERICKSON COLLET CHUCK★★

Model "01" accurate within .0005 or less at the nose.

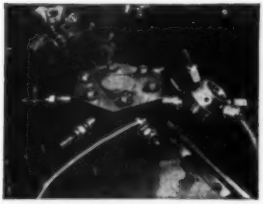
Models 102 and 402 Chucks in use on Automatic Screw Machine.



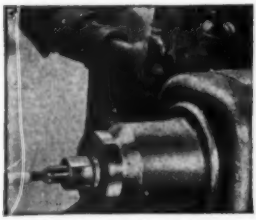
Horizontal Miller with 102 Chuck used to hold Woodruff Key Cutter.

Model 102 Chucks for drilling and tapping operations on Turret Lathe. Jobbers Drill stubbed on chuck in foreground.

Model "02" accurate within .001 or less at the nose.



Main and auxiliary turrets equipped with Erickson Chucks. Note short drill overhang, taps and reamers.

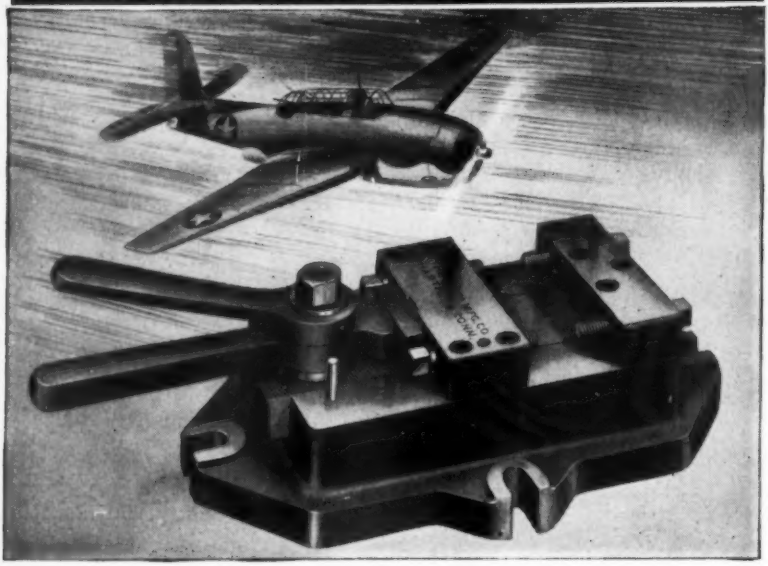


Model 301 Chuck designed for high speed internal grinding operations.

Tool Post Grinder equipped with Model 301 Chuck.

2309 Hamilton Ave., CLEVELAND 14, OHIO

FENN QUICK-ACTION VISE



The War Time Tool that Will Speed Up Peace Time Production

It took a war time emergency to show war production plants the many advantages of the Fenn Quick Action Vise for small parts handling. Wherever there's a milling, drilling, tapping or assembling operation, there's a waiting job for a Fenn Vise, such as small parts for airplanes, machinery, automobile, precision instruments and tools. All working parts made of hardened ground steel. Precision fitted jaws, perfectly aligned. Three sizes: 4", 5", 7". Send for Bulletin No. 15 today.

THE FENN MANUFACTURING CO.
HARTFORD, CONNECTICUT

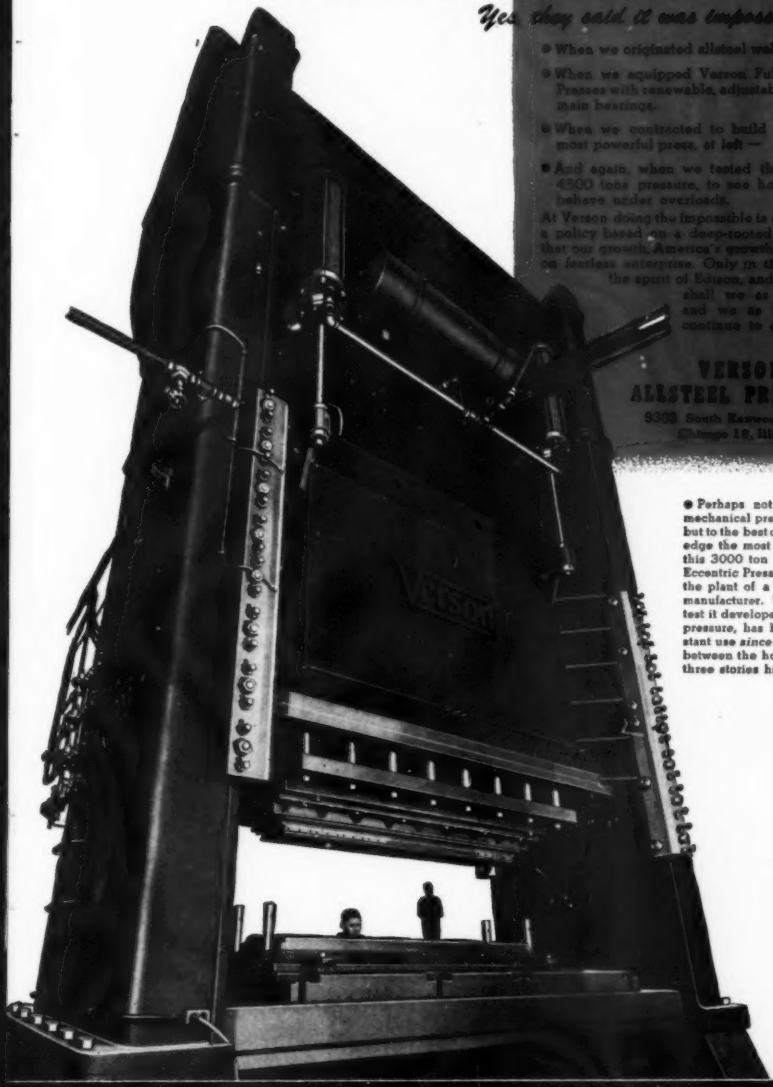
It was Impossible

Yes, they said it was impossible . . .

- When we originated allsteel welded frames.
- When we equipped Verson Full Eccentric Presses with renewable, adjustable split-cap main bearings.
- When we contracted to build the world's most powerful press, at left —
- And again, when we tested this press at 4500 tons pressure, to see how it would behave under overloads.

At Verson doing the impossible is a policy . . . a policy based on a deep-rooted conviction that our growth, America's growth, is founded on fearless enterprise. Only in this spirit . . . the spirit of Edison, and of Ford . . . shall we as a people, and we as a business continue to grow.

VERSON ALLSTEEL PRESS CO.
9303 South Kenwood Avenue
Chicago 19, Illinois



● Perhaps not the largest mechanical press ever built, but to the best of our knowledge the most powerful, is this 3000 ton Verson Full Eccentric Press installed in the plant of a large casket manufacturer. Under actual test it developed 4500 tons pressure, has been in constant use *since 1935*. 154" between the housings, it is three stories high.

HYDRAULIC PRESSES • CLUTCHES
POWER PRESSES • DIE CUSHIONS
FORGING PRESSES • PRESS BRAKES

TORQ

ELECTRIC MOTORS AND DRIVES

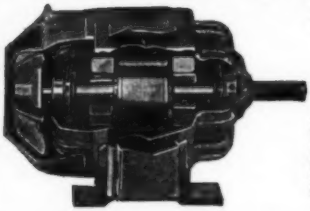
TORQ-QUA-MATIC drives

For machine tool conversion

- 4 selective speeds
- Sizes, 1 to 15 HP.
- Alloy steel gears
- Anti-friction bearings

Proven design—Improves production up to 25 %

Motor shown in sectional view, is Totally Enclosed, Fan Cooled, has Alloy Steel Gears and Anti-Friction Bearings.



PROMPT DELIVERY

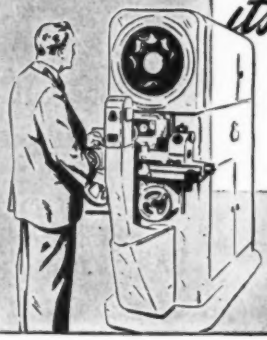
Totally enclosed Type EA Fan-Cooled 1 to 15 Horsepower Motor is shown at lower left.

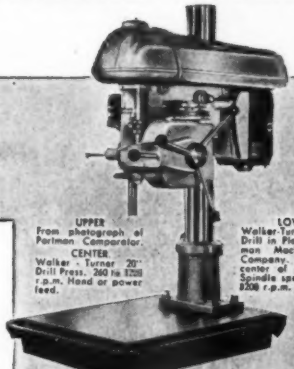
Ball-Bearing. Steel Built. Sealed against harmful oil chips and abrasives. Made for real production.

Send for free descriptive literature containing details on Torq and Torq-Qua-Matic drives.

TORQ
ELECTRIC
MANUFACTURING CO.
6605 CARNEGIE AVENUE
CLEVELAND, OHIO

For Precise Work and Fast Production
it's **WALKER-TURNER**
MACHINE TOOLS!





UPPER
From photograph of Portman Comparator.

CENTER
Walker - Turner 20" Drill Press. 260 to 3208 r.p.m. Hand or power feed.

LOWER
Walker-Turner Radial Drill in Plant of Portman Machine Tool Company. Drills to center of 42" circle. Spindle speeds 160 to 3208 r.p.m.

WALKER-TURNER MACHINE TOOLS have "what it takes" for precise work as well as for fast production. The rigid requirements of many of the products on which they are used offer positive evidence of this. The Portman Comparator is an excellent example.

Walker-Turner quality is the result of careful design and discriminating selection of materials by engineers who pioneered the principle of weight conservation in machine tools. That is why industry is using more than 100,000 Walker-Turner Machine tools today. Send for latest catalog.

WALKER-TURNER COMPANY, INC.
1714 Berckman Street, Plainfield, N. J.

walker-turner
COMPANY, INC.
PLAINFIELD, N.J.
U.S.A.

MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

1. As is . . it's a Surface Grinder

2. With the Univise . . it's a Chip-Breaker Grinder

3. With the Unihead . . it's a Tool & Cutter Grinder

DELTA
MILWAUKEE
Machine Tools

DRILL PRESSES — GRINDERS — CUT-OFF MACHINES — BAND SAWS — ABRASIVE FINISHING MACHINES.

Delta *now offers you . . .*

3 accurate, dependable grinders

Any one of these combinations — by itself — is "a heck of a lot of machine for the money". But take all three together, and you have a saving that no shop, large or small, can afford to overlook.

As a surface grinder, it's a husky, big-capacity machine — over 6 ft. high, weighs close to 700 lbs., grinds surfaces up to 13½" long, 6" wide. Designed for ease and speed of operation.

As a Chip-Breaker Grinder, it gives accurate results in grinding the chip-breaker groove on carbide-tipped tools. Equipped with the Univise, which holds the tool at any conceivable angle, it may be reset at *precisely* the same angles as original setting.

As a Tool & Cutter Grinder, it makes tool sharpening simpler, easier, cheaper, and extremely accurate. With the Unihead attachment, almost any conceivable angle can be ground.

Consult your Delta distributor or write for bulletins. M-80

Specifications

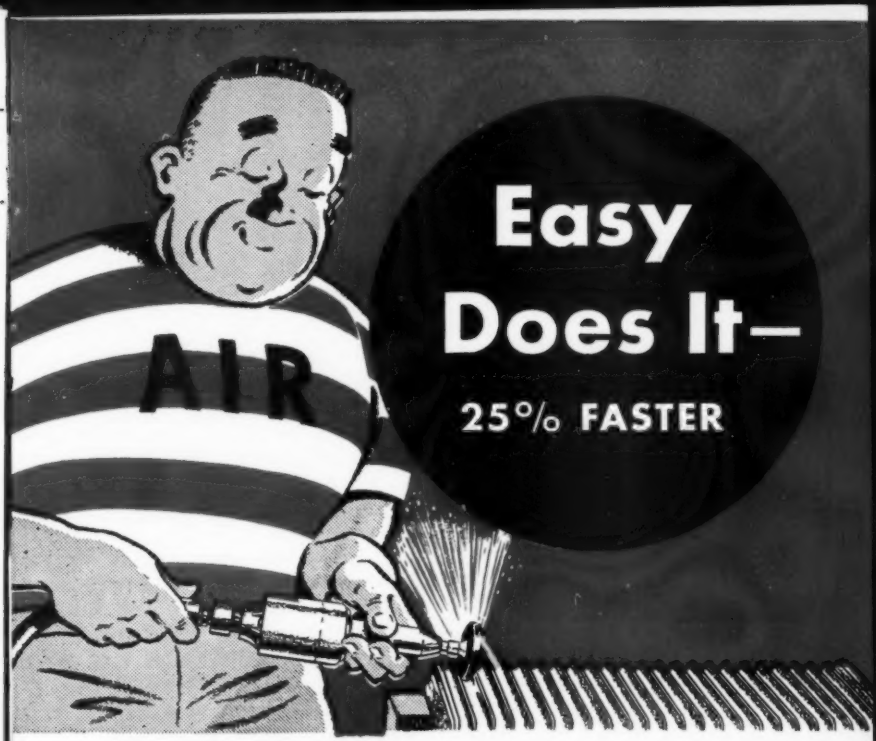
Wheels must have 1¼" hole.
Table surface 5¾ x 13".
Traverse feed, one graduation is .001".
Micrometer adjustment ⅜" range, each graduation is .0005"
Spindle speeds (with 60 cy. 1750 R.P.M. motor) 3200 and 4200 R.P.M.

No. 24-105 Surface Grinder.....$295.00
No. 24-205 Chip-Breaker Grinder 343.50
No. 24-305 Tool & Cutter Grinder 370.00

Priority required, A-1-A or better, under restrictions of Limitations Order L-237.

THE DELTA MANUFACTURING CO.
605A E. Vienna Ave., Milwaukee 1, Wis.
Please send me your catalog and bulletins describing the Delta 3-in-1 grinder combination.

Name.....Position.....
Company.....
Address.....
City.....(.....) State.....

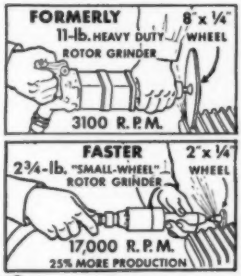


ALONG came these heat exchanger castings with grooves to be ground by ¼" thick wheels. The foundry had only 11-lb., 3100 R.P.M. grinders with 8" x ¼" wheels. They worked . . . but, were they *the right tools for the job?*

They asked the Rotor Application Engineer for an analysis. He demonstrated a 2¾-lb., 17,000 R.P.M. small wheel grinder. Its 2" x ¼" wheel really put this job "in the groove"—sparked out a 25% increase in grinding room production and cut operator fatigue.

Perhaps the Rotor Application Engineer can suggest economies in your operations. He is available without obligation.

Yours for *the right tool*, **AIR O'TOOL**



THE ROTOR TOOL CO.

CLEVELAND OHIO

UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

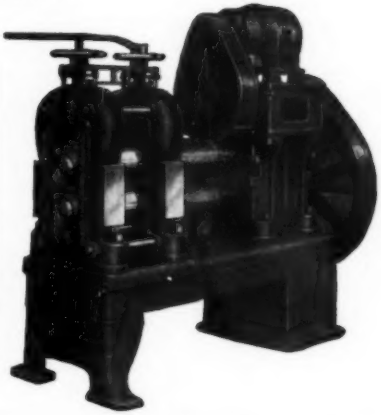
"Standard" ROLLING MILLS

"ENGINEERED" FOR PRECISION AND LONG LIFE

HEAVY DUTY ROLLER BEARINGS

Designed especially for "Standard" Rolling Mills, these bearings have staggered rollers which distribute the load evenly around the journal circumference. Bearings of this type reduce power consumption and insure an even turning of the rolls under pressure. The enclosed type bearings keep the rollers turning smoothly in clean lubricant.

"Standard" Rolling Mills for hot and cold rolling of metal strip, rod and ingot have heavy duty roller bearings which greatly increase their efficiency. These roller bearings typify the careful engineering of all parts of "Standard" Rolling Mills and are an important factor in the outstanding performance of these machines. Shown at right is a typical "Standard" Rolling Mill — the Two-High Medium Duty.



Write for Catalog RM

STANDARD MACHINERY CO.
PROVIDENCE 7, RHODE ISLAND

PRODUCTION

It's a duty now to make tools last longer—to keep them dependable and available for accurate work

The first requirement for getting the most out of precision tools—for helping production "to march"—is to understand the importance of proper treatment.

It doesn't take much—a little care here and there will extend the life of a precision tool and prevent premature impairment of its accuracy. Here are some simple suggestions:

Do not "force" the measuring points or surfaces. Do not carry the tool in a pocket having grit in it. In the grinding room protect the tool from coolant which might carry abrasives into accurately fitted parts. Do not subject dial gages and other sensitive tools to hard shocks. Protect graduations, particularly those on vernier tools, from becoming worn or scratched.

Set tools down gently—do not drop them in a drawer or on a shelf. It is a good plan to keep each tool in a box to prevent other tools from striking against finished surfaces or edges. Bases of tools such as height gages, indicators and V blocks should be kept free from dents or pits and should not be used on surfaces having chips or grit upon them.

Finally, keep tools clean and lightly oiled to prevent rusting.

Each tool saved from premature wear means one more available for the manufacture of the implements of war our armed forces need.

We are proud to be honored with the Navy "E" awarded for outstanding accomplishment in National production. Brown & Sharpe Mfg. Co. Providence R. I., U. S. A.

Reproductions of this advertisement for use on your bulletin boards furnished upon request.

BROWN & SHARPE TOOLS

Save VITAL GRINDING TIME

HANDLE a WIDER RANGE of WORK *FASTER with this* QUEEN CITY HEAVY DUTY FLOOR GRINDER

You get every ounce of productive capacity with this efficiently designed ball bearing grinder. Turns out more work in less time . . . accurately and with improved quality — even with unskilled workers. Completely equipped, ready for immediate use. For more than 25 years, leading plants have used the Queen City line of grinders to improve production, cut costs, save manpower. Write for details and catalog B-1.

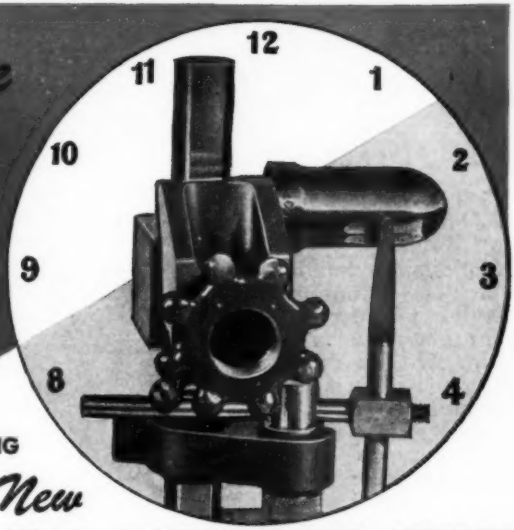
Dealers in principal cities.

Specifications

Model 3F. Induction-type motor, 1750 rpm. 2—10" dia., 1¼" Carborundum wheels, one coarse, one fine. Complete safety equipment. 51" high, base 20" x 15". Spindle dia., ⅞". Tool rests, accurate and adjustable.

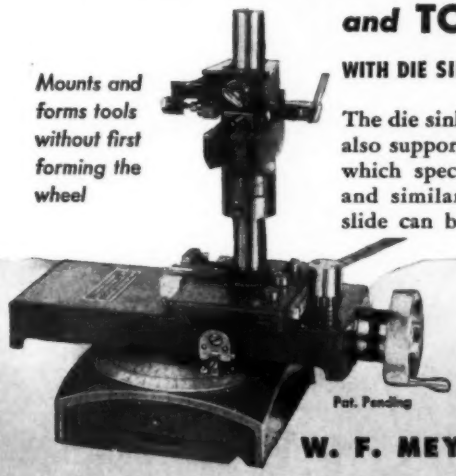
QUEEN CITY MACHINE TOOL Co.
217 E. SECOND ST.
CINCINNATI 2, OHIO

Save
MAN HOURS
forming
DIE SINKING TOOLS



BY USING
The New
MEYERS RADIFORM WHEEL
***and* TOOL FORMER**
WITH DIE SINKING TOOL ATTACHMENT

Mounts and forms tools without first forming the wheel



The die sinking tool attachment will also support end mills and drills on which special points are desired—and similar tools. The compound slide can be replaced with a small motor to form sockets and various other forms and difficult production pieces. Write for descriptive literature.

W. F. MEYERS COMPANY
1012 FOURTEENTH STREET • BEDFORD, INDIANA

DUAL-SPIRAL REAMER BREAKS BOTTLENECK ON MOSQUITO BOMBER TAILFORK PRODUCTION!

An important aircraft plant has been battling the problem of finishing holes in Durol split bushings for the past 7 months. Now they write ". . . Lempco reamers have given us a solution." Perhaps they can solve a similar production problem of yours. This Hi-Speed Steel Expansion Reamer has 3 blade segments, 2 of which spiral in a direction opposite to the 3rd, causing a shearing action which finish reams mirror-smooth any machinable metal.

★ Adjustable for Size Instantaneously on the Job!

★ Makes Clean Holes.

★ Eliminates Costly Wear on Plug Gauges caused by Abrasive Left in Honed Holes.

★ Removable blades are Easy to Resharpen.

★ Extension Pilots for Alignment Jobs.

★ .050" to .080" Straight Line Expansion* (in both radial and chordal planes).

★ Reams Smoothly over Keyways and Split Bushings.

*(Sizes under 11/16" slightly less)

WRITE FOR CATALOG

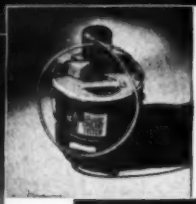
LEMPCO

5729 DUNHAM RD., BEDFORD, OHIO, U.S.A.

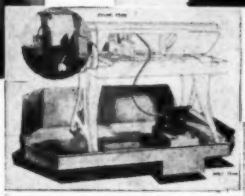
Use *coolants* on *all* your machines..

...TO SAVE TIME—TOOLS AND INCREASE PRODUCTION

Model H-10A Centrifugal — capacities 10 to 1,000 gals. per hr.



Left: Standard Model — capacities up to 130 gals. per hour.



Above: Heavy Duty "A" Series Model — capacities up to 165 gals. per hour.

GRAY-MILLS *Portable* COOLANT SYSTEMS

HERE is the simple, economical way to equip your machines to use coolants — to help them produce more and better work — faster! Gray-Mills Systems have increased the efficiency of hundreds of machines on operations like drilling, milling, sawing, grinding, honing, tapping, threading and cutting. They are quickly and easily set up to operate either as a permanent or temporary part of a tool. Sturdily built Gray-Mills Systems are available in both gear and centrifugal types with capacities from 50 to 1,000-gals. per hour — controlled flow. Prices range from $39.50 to $189.50.

Call your distributor or write direct.

Above: Model S-20 system for horizontal band saws.

Right: Standard model serving 2 drill presses.

Below: "A" series model on a bench lathe.

Use FLO-BAC COOLANTS

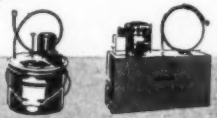
There are 5 types of these quality fluids to cover most every requirement. Available in 10 and 55-gal. containers. Immediate delivery from your distributor or our plant.

Send for this new catalog — it gives full details.

PROMPT SHIPMENTS

GRAY-MILLS

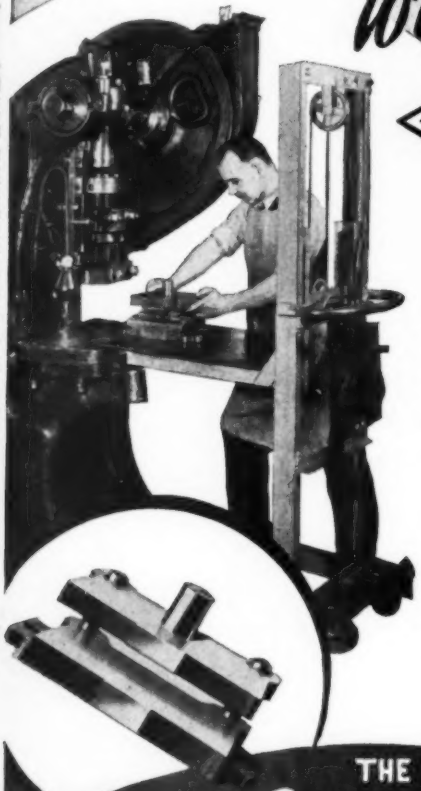
Complete Portable COOLANT SYSTEMS



Capacities 50 to 1000 G.P.H.
Pressures 8 to 150 lbs.

GRAY-MILLS CO., 827 W. Ontario Street, Chicago, Illinois

get TOP PRODUCTION with PRODUCTO



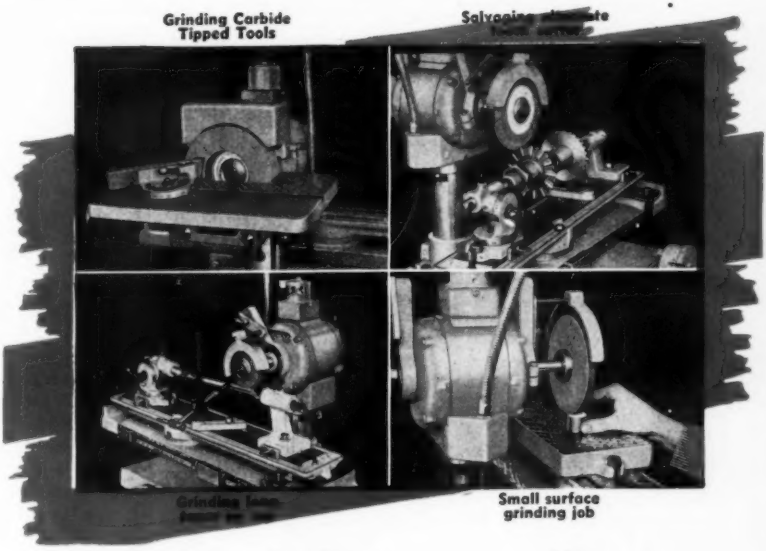
DIE SETS

In these days of dizzy production schedules you can't afford to spend precious hours and manpower on anything but the best. When we say PRODUCTO DIE SETS are "TOPS" we mean it, and the same word describes our Service. Our enlarged facilities at any of our four assembly plants at Bridgeport, Detroit, Cleveland or Los Angeles mean that your order will be promptly filled and shipped without delay on Catalog Items. Special DIE SETS will be quickly made and shipped from either our Bridgeport or Detroit Plants.

DIE MAKERS, ACCESSORIES AND MACHINE VISES

THE MACHINE *Producto* COMPANY

990 HOUSATONIC AVE., BRIDGEPORT, CONN. • 3017 MEDBURY, DETROIT, MICH.



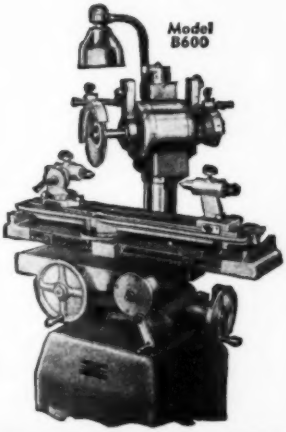
NEW *Knock-Out*

UNIVERSAL TOOL GRINDER

Tool Room or Production Grinding

Fast — Accurate — Economical

New literature with many operating pictures just off the presses, waiting for you!



KNOCK-OUT

Write for Booklet No. UTG-43-H

THE K. O. LEE CO.

ABERDEEN SOUTH DAKOTA

READY WITH THE NEW METAL BONDED DIAMOND IMPREGNATED

CUT-OFF or SLOTTING BLADE

This is the sawblade that will do a job your ordinary blade can't do. It will cut or slot Tungsten Carbide, Tempered Glass and other similar materials. With this blade you can salvage those chipped, cemented carbide tipped tools by cutting of the damaged part.

It's the trustworthy sawblade with the safety features! Because it is not brittle, it will not tear apart. No danger of flying pieces . . . it is made of special alloyed solid metal, and the diamonds are cold-welded in place. It is a long-awaited improvement!

Delivery in 10 Days

●

HOLE SIZES:
⅝", ¾", ⅞", 1", 1⅛", 1¼"

No. 34-3—3" Diameter makes .042 cut	$19.
No. 34-4—4" Diameter makes .042 cut	23.
No. 34-6—6" Diameter makes .042 cut	30.
No. 34-8—8" Diameter makes .047 cut	37.

Try Out Metal Bonded Diamond Hand Hone. Saves Time! Coarse, medium or fine grits.... **$15**

OSCAP MANUFACTURING CO.

Diamond Tool Replacements Division
207 W. Saratoga St. **Baltimore 1, Md.**

. . . AS THOUGH
BORN TO THE SADDLE

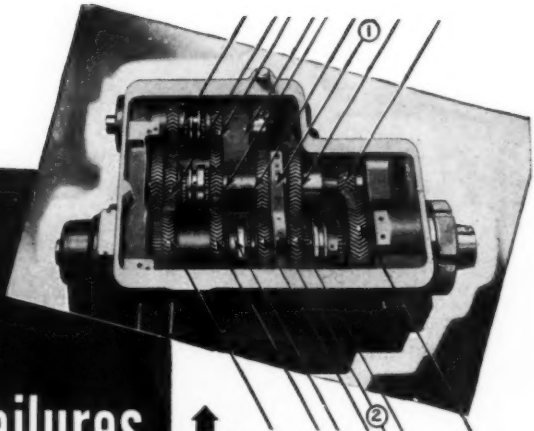
Busting a bronco is no job for a tenderfoot. It takes the stamina and stick-to-itiveness of an experienced hand. Where power must be sure, always, there's a job for Wesche custom-built motors. Turning out specific motors for specific jobs is a specialty with Wesche. Welco Torque Motors are fast, efficient, dependable, adaptable. Mountable in any position. They give "power where power is needed."

Feel free to call upon Welco engineers for assistance on any torque motor problem in your war production, or post-war planning.

THE B. A. WESCHE ELECTRIC CO.

1628 VINE STREET **CINCINNATI, OHIO**

Guarded against costly failures



Headstock of Sidney Lathe. Numerals 1 and 2 point to center bearings; other arrows indicate 14 Ampco bushings in the gears.

. . . with bushings and center bearings of wear-resisting Ampco Metal . . .

Reg. U. S. Pat. Off.

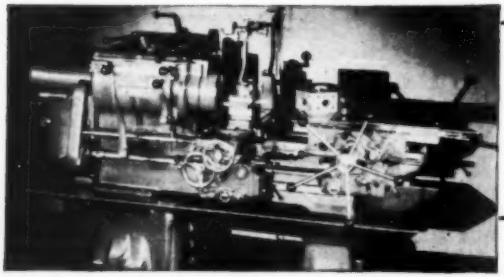
AMPCO Metal

The Metal without an Equal

When you buy machine tools or other heavy equipment, it pays to check for parts of Ampco — the metal that stands up and gives several times the life of ordinary bronzes. Adopted by 90-odd leading machine tool manufacturers. • Write for bulletins which will aid you as a buyer and user of machinery — or help you specifically with your design problems involving wear, corrosion, shock, or other severe conditions.

Ampco Metal, Inc.

Department MT-1 **Milwaukee 4, Wisconsin**



For replacements When you experience the failure of bronze parts, replace them with Ampco. Ask nearest Ampco Field Engineer for suggested procedure and Ampco Metal stock list to fit the specific needs of your Maintenance Department.

Ampco has long been standard with the Gisholt Machine Co.

Torque Wrenches

MORE ACCURACY LIFE SPEED

3 DIALS

NO FRICTION
ADJUSTMENTS
MORE PARTS
FRAGILE MECHANISMS

No. F100
Recommended for capacities in foot lbs. from 0 to 100, graduated in steps of 5 foot lbs. Other sizes shown range in maximum capacities from 25 to 600 foot lbs., and from 25 to 7200 inch lbs. When ordering state capacity needed.

SPECIAL T. HANDLE STYLES WITH MAXIMUM CAPACITIES FROM 100 TO 7200 INCH LBS.

Pioneer Manufacturers of Accurate Measuring Wrenches

P. A. STURTEVANT CO.
ADDISON QUALITY ILLINOIS

Manpower — Labor Turnover?

● There are definite limits to what can be done in meeting the current manpower situation. You simply have to do the best you can with the labor that is available.

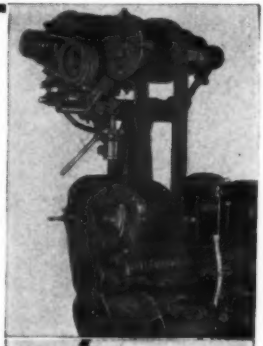
But you can break production bottle-necks in many cases by modernizing your machine tool equipment. A vital step in that direction is to improve the drives, for any machine tool is **only as new** as its drive.

Berkeley drives enable you to maintain top production with available labor, providing the most efficient speeds for the jobs — operating at higher speeds or with heavier cuts — taking full advantage of the latest carbide tooling.

Berkeley makes all types of drives for all kinds of machine tools. Each drive is "custom made" for your particular job — easily installed because Berkeley welded steel brackets are individually engineered for your machines and your shop conditions.

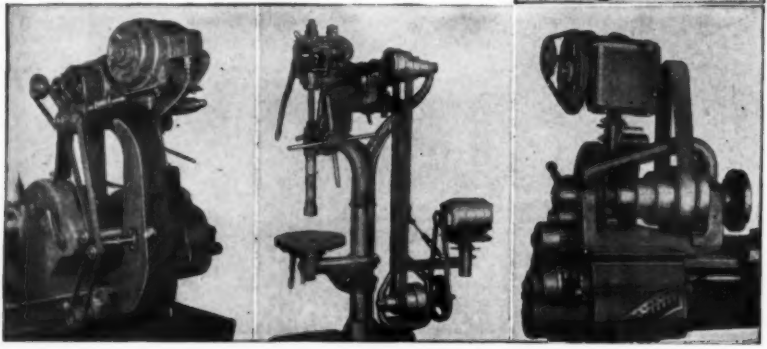
Berkeley drives are designed and made by a pioneer specialist in machine tool drives. Without obligation, let our engineering department tell you the best way to get more work and more profit out of the machine tools you now have and the men you have to run them.

Any way, let us send you copy of our new bulletin, illustrating and describing the different types of Berkeley drives and showing typical installations.



Berkeley Equipment Co.

1022 Bahls Street, **DANVILLE, ILLINOIS**



MODEL 00-B

The WYCO Line

FLEXIBLE SHAFT MACHINES

"DIE MAKER'S"

High Speed Grinder

2 MACHINES IN 1

Hang it from the ceiling or Stand it on the bench.

There are WYCO Flexible Shaft Units for Every Requirement . . .

Sturdy, dependable machines, with long-life shafts, satisfying the most exacting demands with continuous service — and doing the finest kind of work.

Model 00-B is built to serve the die maker — 3 Speeds, instantly selective — ¼ H.P. Constant Speed Motor. No Racing when Idle! No slow-down under Load.

Every WYCO Machine has the WYCO Patented Non-Metallic *Innerliner*

Prolongs Shaft Life
Makes the Core last longer
Run smoother
Transmit more power.

Here is the Grinder you have been waiting for — Write Today for Catalog.

WYZENBEEK & STAFF, INC.
838 W. HUBBARD ST., CHICAGO, ILL.

DIFFICULT INTERNAL FINISHING PROBLEMS SOLVED

with the Sunnen Precision Honing Machine

The coveted Army-Navy "E" waves over the Sunnen plant —evidence of the important part Sunnen equipment is playing in the war effort.

Consider These Advantages

Wide range — handles internal diameters of .185" to 2.625". Accuracy within "one-tenth" guaranteed — has been held to .000025" on production jobs. Relieves big internal grinders for other jobs. Corrects errors of out-of-roundness or taper caused by previous operations. Facilitates duplication of sizes. Does not require skilled labor. Practical — inexpensive — economical to operate.

Put Sunnen Honing to work in your plant!

Typical Jobs

Aircraft Instrument Panel Control Wire Bushing. Hole .187" diameter—held to .0002", stock removal .001", 60 per hour.

Header Die. Life of header dies increased 3 to 9 times over lapping. Knock out pin breakage practically eliminated.

Shell Loading Die.

Stainless Steel Load Compensator Valve Seat. Hole is honed to .0002" limit.

Cast Iron Valve Stem Guide. 1/2 to one thousandth removed — 220 pieces per hour. Better finish and straighter hole.

Aircraft Hydraulic Brake Cylinder. Honing 3 times faster than lapping—and gave a straighter hole.

Aircraft Piston Pin. Sunnen honing is twice as fast and gives a cleaner, better looking pin.

Aircraft Valve Tappet Roller. Honed after grinding to give 100% bearing surface.

Aircraft Carbureter Operating Valve Sleeve. Sunnen honing eliminates distortion from assembling operation.

Hydraulic Control Bushing. Honing gives straight round hole after rough reaming.

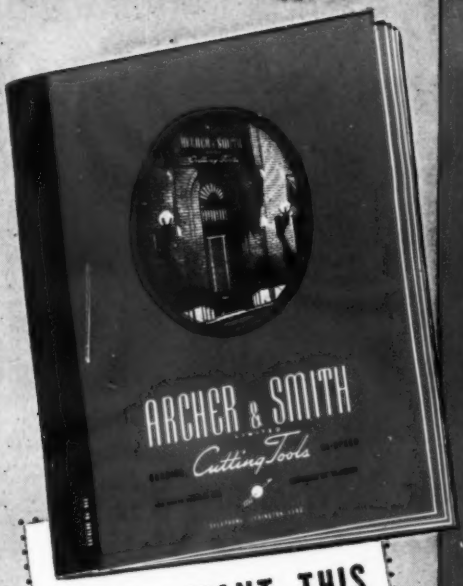
Carbureter Idler Valve Jet. Hole is honed after reaming for smooth action.

Automobile Distributor Shaft Gears. Taper removed at a rate of 80-90 per hour.

SUNNEN

SUNNEN PRODUCTS COMPANY • **7935 Manchester Ave., St. Louis, Mo.**

Canadian Factory: Chatham, Ontario



YOU'LL WANT THIS NEW TOOL CATALOG

For the Data it Contains

It Proves

that here are modern facilities for all that is best in precision and service in cutting tools!

Write for Catalog — Send Blueprints

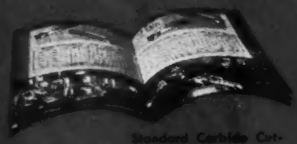
ARCHER & SMITH

LIMITED

CARBIDE *Cutting Tools* HI-SPEED

TELEPHONE:
LEXINGTON 5380

Special Hi-Speed and Carbide Cutting Tools Made to Your Blueprints.



Standard Carbide Cutting Tools

Modern Precision Production Facilities — Skilled Precision Toolmakers

Ideal Working Conditions — Pleasant Recreational Surroundings.

ARCHER & SMITH, LTD.,
125 NORTH EASTERN AVE.
LEXINGTON 34, KENTUCKY

Please send latest Cutting Tool catalog. ☐ Blueprints of special tools we require are enclosed; or ☐ mailed under separate cover.

Name.....**Title**.....

Firm Name.....

Address.....

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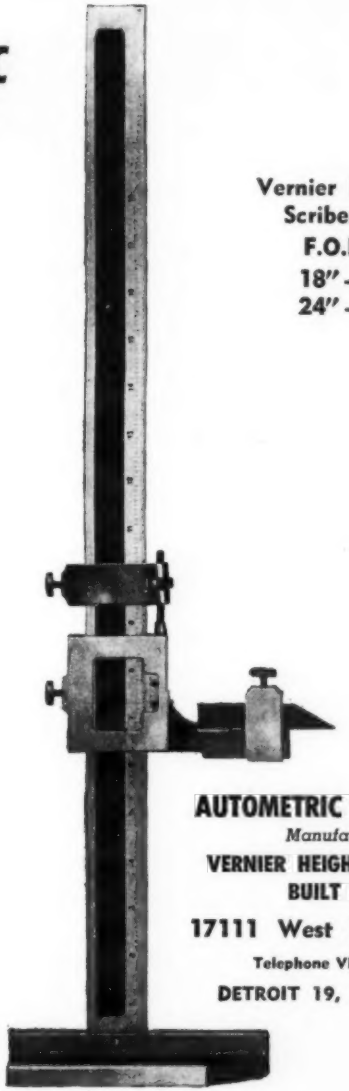

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FEATURED in This Issue

FUNDAMENTALS in Milling Practice, is the second part of Dr. Frommelts's series of articles. He discusses coolants and their use, different types of milling cutters, speeds, feeds, and many other factors contributing to modern milling practice. The article should be helpful in training new milling machine hands, and commences on page.....133

CONSERVATION in Filing, By H. J. Chamberland offers some constructive suggestions. He sketches the art of filing briefly, tracing the development of continuous band filing. See page.....169

CARBIDE MILLING of Steel is discussed under Trends on the Production Front. Some new developments are described pointing the way to speedier milling of steel.

New developments in the fields of plastics, die castings, and power metallurgy are also mentioned briefly. See page 183

TOGGLE CLAMPS have been very helpful in solving some difficult holding jobs. A few of these are described in Mr. Robeson's story commencing on page.....199

THE COMMON COLD is responsible for a startling loss of time every year. Fatigue and occupational diseases also take their toll. Mr. Mottershead discusses some of the things that can be done to check these saboteurs of the war effort in his article beginning on page.....209

WELDING COSTS and the factors which must be considered in calculating them, are presented by W. J. Conley in a very illuminating article on page.....231

DIAMOND POWDER is finding increasing use in lapping. The various essentials are discussed by R. H. Taylor in a story commencing on page.....245

THE TAX PICTURE in the days ahead is discussed by Arthur Roberts. He emphasizes the importance of modernizing and overhauling accounting methods, in the story commencing on page.....250

A NEW METHOD of splicing woven cotton belting is on page.....261

HELPFUL HINTS and kinks on many topics are presented in the regular section commencing on page.....265

NEW EQUIPMENT and new tools are in the section commencing on page....300

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As The Editor Sees It

AIR power will undoubtedly blast the way to final victory.

Yet during the past eleven months, labor turnover in Western plants caused man-hour losses sufficient to have produced more than two thousand Flying Fortresses.

Every month 20,000 workers (count ' em) have strayed from their jobs in aircraft plants.

An average of fifty-six percent gave personal reasons for quitting—"marriage"—"need a vacation" —returning to former job—etc.

Since it costs an average of about $200 to hire and train each worker, the turn-over loss at the present high rate equals approximately 48 million dollars—enough to have paid for 640 P-38's, Mustangs, and Thunderbolts, which might have been blitzing the Nazis and the Japs.

One sure way of shortening the war and cutting casualty lists is to slash this serious turnover rate.

Cut the turnover in half and most of the aircraft industry's manpower problems will be solved.

During the last ten minutes of World War I, more than 4,000 men were killed. This figures more than 400 a minute that might have been saved had the war not been prolonged a mere ten minutes.

By staying on the job and giving his best, every worker can help to shorten this war and save precious lives.

Without good and sufficient reason, can any worker's conscience justify a change of job that will delay or hinder war production?

Nothing else matters but victory at the earliest possible moment.

Wesley G. Paulson

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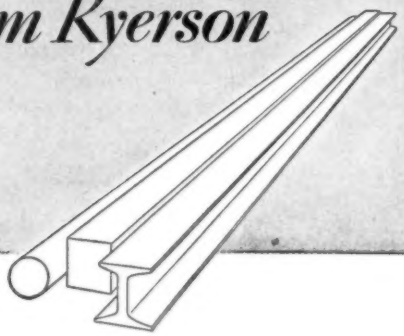

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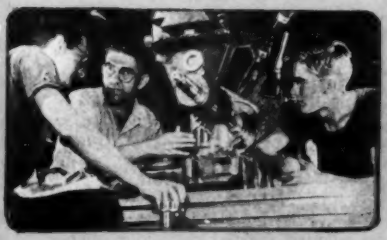
Fundamentals in Milling Practice

By Dr. H. A. Frommelt



COOLANTS AND THEIR USE

THE proper use of coolant is essential for good results in most metal cutting operations.

Cast Iron

Except in unusual instances and for special kinds of cast iron, seldom encountered, coolant is not used when milling cast iron. This material contains carbon in the graphite form. Since graphite is in itself a lubricant, coolant is unnecessary when cutting or milling cast iron. Moreover, the coolant may combine with cast iron to form sticky and gummy lumps, which prevent good finishing operations.

Steel

For the lighter, more easily machined steels, a water soluble oil is recommended as a coolant. For steels more difficult to machine, the heavier cutting oils should be used.

Coolants should be directed immediately over the cutter and on the contact area between it and the workpiece.

Coolants are used, not only to cool the cutter, the workpiece, and the chips, but also to lubricate the sliding contact between the cutter and the workpiece. (See Fig. 43).

Sometimes coolant is used, not so much to cool and lubricate as to flush chips away from between cutters and workpieces. In Fig. 44 is shown an operation in which narrow saws are accommodated in the slot of the top plate of a fixture. Unless a large volume of coolant prevents chips from clogging these slots, cutters will be dulled quickly, workpieces will not be properly finished, and cutters will tend to spring away from the work.

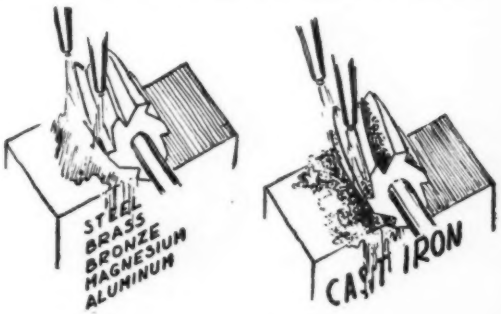


Fig. 43—Use recommended coolants on steel and nonferrous materials such as bronze, aluminum and its alloys. Using coolant on cast iron is wrong. This material is usually machined dry.

CUTTERS

Any adequate discussion of the milling process must include cutters. In Fig. 45, the more commonly used milling cutters are shown. The saw is employed for cutting off and slotting, and is similar to that used in woodworking.

Both the face mill and the slab mill are used for flat surfacing while the end mill is used for routing, grooving, and contour milling.

The T-slot cutter, as shown in this illustration, is in fact, a special cutter adapted for the particular operation of milling a T-slot. The side mill, as its name indicates, is used to mill a flat surface with its side teeth. The staggered tooth cutter, whose name emphasizes its special characteristic, is used for the milling of narrow slots and grooves. Interlocking cutters are similarly used, and can be built up into the width across the face of the teeth as called for by the specifications.

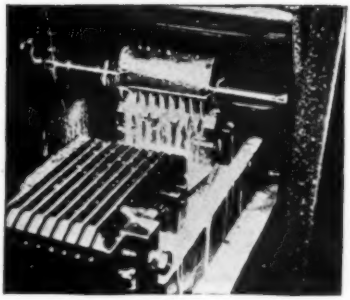
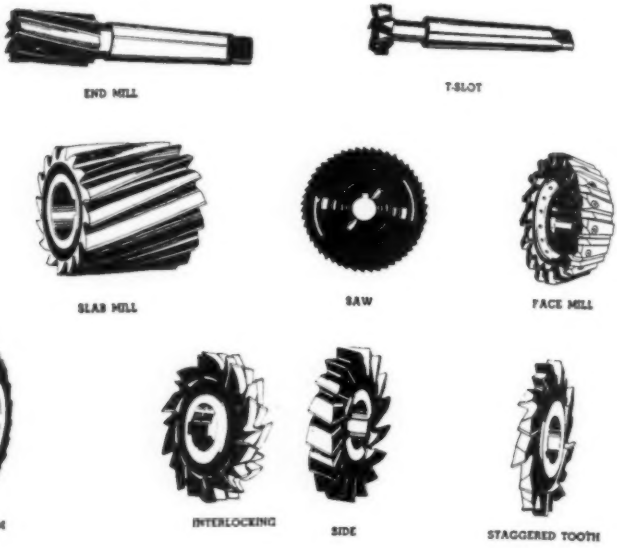


Fig. 44—Here is a job on which coolant is essential for flushing out chips. Fig. 45—(below) illustrates common types of milling cutters.

A form cutter may, from its name, take any form. That shown in the illustration is for the milling of an involute gear

COMMON TYPES OF MILLING CUTTERS

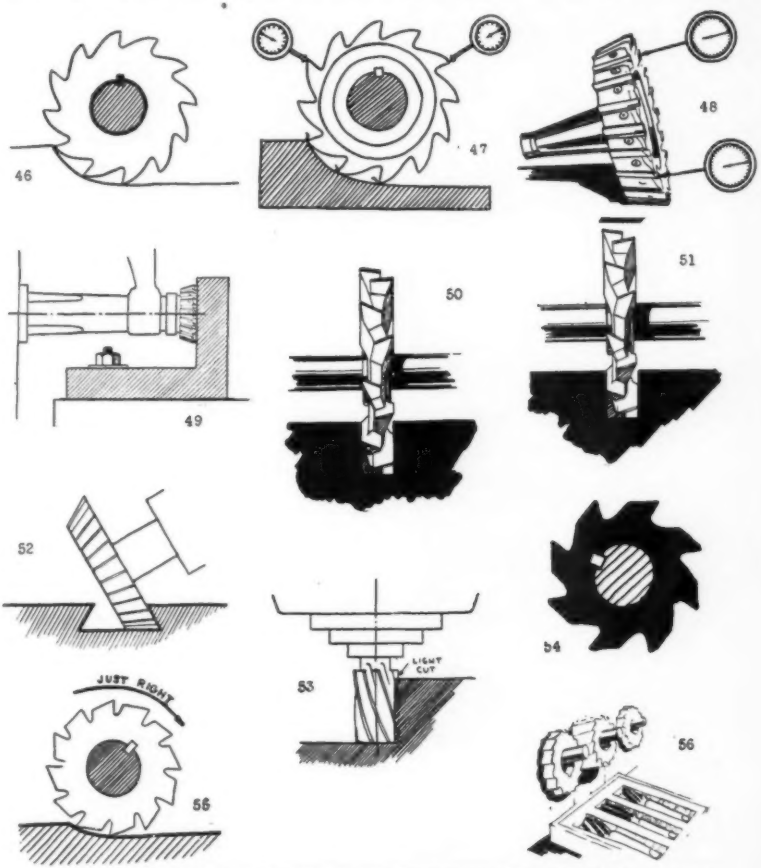


tooth, but any form that can be built into a cutter will reproduce itself in the workpiece.

Sharpening Cutters

Perhaps the most obvious, and yet the most commonly violated rule is that cutters must be kept sharp. Often there is a strong temptation to keep dull cutters running. Time spent in sharpening dull cutters always pays dividends in accurate and economical workmanship. (See Fig. 46).

Cutters, however, should not only be sharpened for fast milling and good finishes. They should be ground so that the cutting tips all lie in the same circle. Tips higher than others do more than



Figs. 46 to 56 inclusive are included in the illustrations above. All of these are adequately described in the text.

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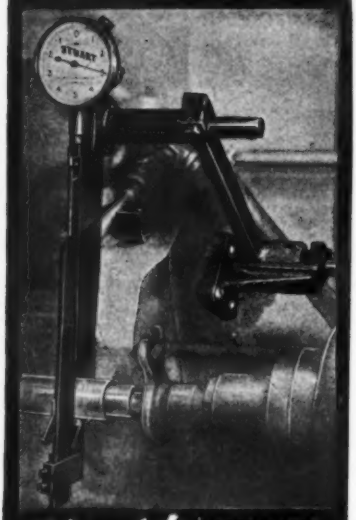

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their share of the work, and thus break down quickly. Tips not so high are just as quickly dulled because of friction between them and the workpiece. (See Fig. 47).

Carbide Tipped Cutters

Special attention should be given Tungsten Carbide Tipped Face Mills when grinding. All of the cutting edges on the face of a Face Mill should be ground to within two-tenths of a thousandth of an inch. This tolerance should be checked by means of an indicator. Unless so ground, the higher cutting edges will break down quickly, thus limiting the life of the cutter and its production between grinds. (See Fig. 48).

Particular attention should be paid to the mounting of Carbide Tipped Cutters. Rigidity is always important in any setup, but particularly so when using Carbides. Unless the cutter and the workpiece are rigidly and firmly held, the Carbide Tips may be shattered. (See Fig. 49).

Cutters not only must be properly ground and mounted but also correctly selected. A few instances will indicate the importance of proper cutter selection in good milling practice.

A staggered tooth cutter should be chosen for milling deep grooves and parts. Since the teeth on such cutters are alternately set at equal but opposite angles, the horizontal forces on the cutting edges are equal and opposed. Hence, the staggered tooth cutters tend to act as balanced cutters, and hence eliminate, in part at least, vibration in the milling of deep and narrow grooves. (See Fig. 50).

When there is danger of chips packing between cutting edges and the job, as in the milling of a groove (See Fig. 51), a staggered tooth cutter will assist in clearing away the chips. Such a cutter produces smaller chips, i.e., not so wide as the slot, and hence, there is less likelihood of troublesome packing-in of chips between cutter and workpiece.

In the milling of a dovetail as indicated in Fig. 52, a circular cutter, mounted as shown, is to be preferred. This represents a much more rigid setup, with less likelihood of the cutter springing away from the workpiece.

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It should be added also that this choice of cutter represents a more economical operation since many more cutting edges are in contact with the workpiece in a circular cutter than in an end mill which might be used for such an operation.

If an end mill is used, as shown in Fig. 53, the depth of cut must be reduced to prevent springing of the cutter away from the workpiece. Obviously, too, the shank of the cutter should be gripped as close to the cutting edges as possible.

A general rule that pays good dividends when properly applied is the choice of a coarse tooth cutter over a fine tooth cutter. The former produces better work and helps to eliminate chatter. (See Fig. 54).

Finally, selection of the proper speed is essential to good cutter operation and economical and effective workmanship. (The proper speed and feed means fewer grinds and longer life for the cutter, (See Fig. 55).

Care of Cutters

The subject of cutters would be incomplete without some reference to the proper care of cutters when not in use removing metal. Circular cutters should be mounted on wooden pegs, while end mills can be laid away in wooden trays as shown in Fig. 56. Cutters that are carelessly piled up on tables and shelves are frequently nicked by falling to the floor.

Speeds and Feeds

The discussion of cutters leads logically and directly to a consideration of speeds and feeds.

The term "Speed" refers to the revolution of the spindle or cutter; while "Feed" refers to the rate of travel of the table (or saddle, or knee) carrying the workpiece into the cutter.

The proper selection of speeds and feeds for a particular job is essential for good results. This generally embraces good workmanship and also specifically, good finish and longer cutter life as indicated in Fig. 57.

The speed dial on milling machines is usually located somewhere on the column and is shown in Fig. 58. As will be noted,

Uniform marking

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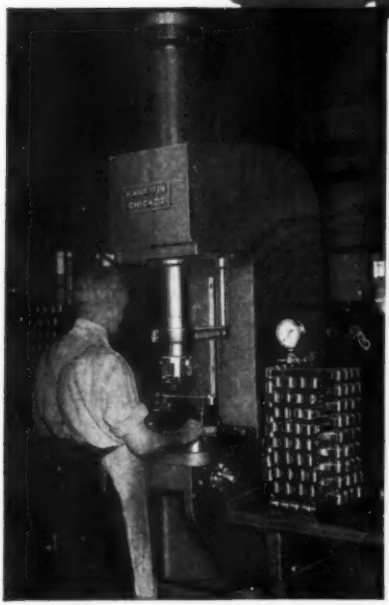

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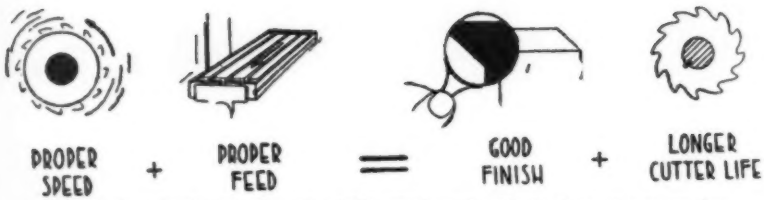

Fig. 57—Care in the selection of spindle speeds and table feeds is of extreme importance in producing good finish and extending cutter life.

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modern machine tools such as milling machines provide a wide range of speeds. Once the operator has determined the correct speed for the job at hand, the dial handle is turned to the selected speed, as shown in the illustration.

Fig. 58—Speed indicating dials on milling machines are usually located somewhere on the column.

Important is the selection of the proper speed. This is determined by a number

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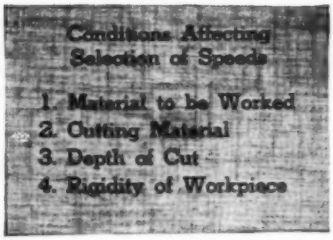

of factors shown in Fig. 59. These important factors include:

1—The kind of metal. (See Fig. 60)

2—The kind of cutting material. (See Fig. 61)

3—The depth of cut. (See Fig. 62)

4—The rigidity of the workpiece. (See Fig. 63)

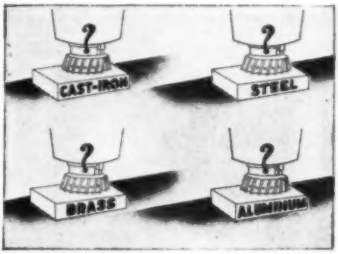

Fig. 60—The kind of material worked has a vital bearing on the milling procedure.

Obviously, the kind of metal will affect the selection of cutter speed. When cutting steel, the speed will be different from that when cutting aluminum, for example.

The kind of cutting metal also plays an important part in cutter speed. Carbon tool steels, now infrequently used, must be employed at much slower speeds than, for example, the modern carbides.

Obviously, the depth of cut plays an important part in selecting the proper speed. And finally, the rigidity of the workpiece is an important factor in making this selection, as indicated in Fig. 63.

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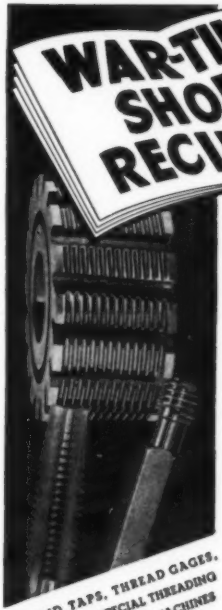

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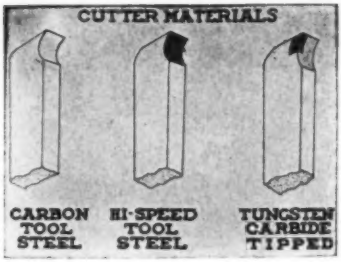

Fig. 61—The cutter materials available largely determine feeds and speeds.

It is important to remember that the speed of the cutter in revolutions per minute is only one factor in determining the rate at which the cutting edge is advancing thru the workpiece. The diameter of the cutter is the other factor and together with the revolutions per minute, determines what is referred to as the surface feet per minute of the cutter, or cutting edge.

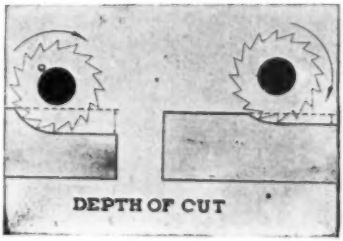

Fig. 62—The depth of cut is important in selecting the proper speed.

Thus, as shown in Fig. 64, a cutter 4″ in diameter (12″ or one foot in circumference) must operate at 250 revolutions per minute so that a cutting edge or tip on its circumference will travel 250 feet per minute. But if the cutter is 8″ in diameter (See Fig. 64) with a circumference of two feet, it would have to be operated at only 125 revolutions per minute to cause the cutting edge on the circumference to travel 250 surface feet per minute.

To determine the proper cutting speed of a cutter, it is convenient to begin with

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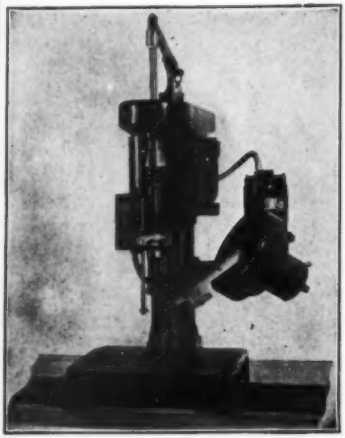

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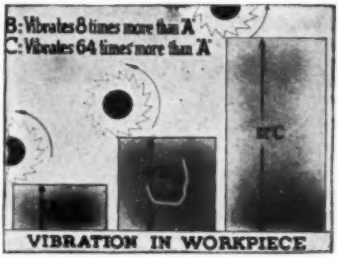

Fig. 63—Still another vital element in milling operations is rigidity of the work piece.

a table such as Fig. 65, which from experience provides the correct cutter speed in feet per minute. It will be noted that this table depends upon the kind of material being milled and the kind of material in the cutter. Thus, when milling soft cast iron with tungsten carbide, cutter speeds up to 325 feet per minute can be used, according to the table in Fig. 25AM. On any given job, the material in the workpiece as well as the material in the cutter are known. This provides a starting point and for this purpose, the table just mentioned is used.

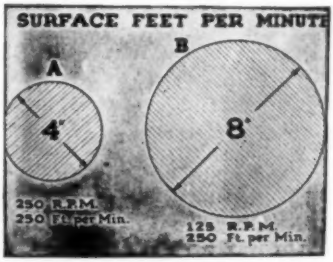

Fig. 64—Comparison of cutter diameters and surface feet per minute.

Once the surface feet are known, the chart in Fig. 66 is used. But if a surface foot rate of 190 is taken from Table 25AM, and the job calls for a 4" diameter cutter, the revolutions per minute as indicated in Fig 65 are 165.

It will be noted that in arriving at the speed by this method, no account has been taken of such factors as depth of

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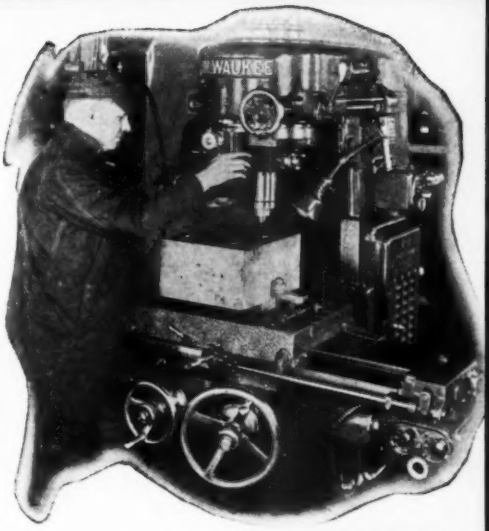

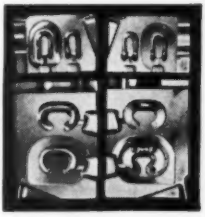

This is typical of the forging dies produced by Maine Steel, Inc. The Milwaukee Rotary Head Miller has saved this firm over 30% in die-sinking time on dies of this type.

Kearney & Trecker's Rotary Head Miller is regarded by the majority of users as the most versatile machine ever designed for die and mold work. Direct — fast — accurate — it reduces initial job preparation and set-up time to the minimum—saves operator's time and assures rapid production of dies and molds. Write for Bulletin No. 1002C for full information on this unusual machine tool.

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CORPORATION
Milwaukee, Wisconsin
Subsidiary of Kearney & Trecker Corporation

Milwaukee Face Mill Grinder
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Milwaukee Speedmill

FIG. 65—GUIDE TO CORRECT SPEED SELECTION

Material To Be Milled	MATERIAL IN CUTTER					
	Carbon Tool Steel	High Speed Steel	Super Hi-Speed Steel	Stellite	Tantalum Carbide	Tungsten Carbide
	CUTTER SPEED IN FEET PER MINUTE					
Aluminum	250–500	500–1000		800–1500		1000–2000
Brass Soft	40–80	70–175		150–250		350–600
Bronze Hard	30–60	65–130		100–160		200–425
Bronze Very Hard		30–50	50–70			125–200
Cast Iron Soft	30–40	50–80	60–115	90–130		250–325
Cast Iron Hard		30–50	40–70	60–90		150–200
Cast Iron Chilled			30–50	40–60		100–200
Malleable Iron	35–50	70–100	80–125	115–150		250–370
Steel Soft	30–45	60–90	70–100		150–250	
Steel Medium	30–40	50–80	60–90		125–200	
Steel Hard		30–50	40–70		100–150	

cut, rigidity of workpiece, etc. Experience alone can dictate the extent to which such factors must influence the selection of the speed. At any rate, the method just indicated for selecting the speed of the cutter is always a good starting point.

Rules and formula for both speeds and feeds are indicated in Fig. 67, and "start and go" calculations are presented Fig. 68.

The feed dial on milling machines is usually located on the front, frequently on the knee. A feed dial is shown in Fig.

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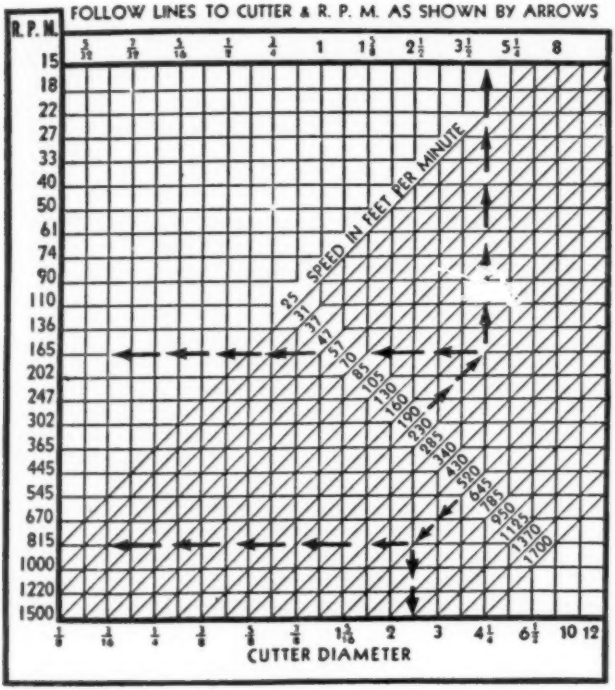
FIG. 66—CHART SHOWING COMPARATIVE CUTTER DIAMETERS AND RPM.



69 and indicates the wide range of selection available to the operator.

The conditions affecting the selection of feeds are, among others:

1—The power available in the machine. 2—Rigidity of the machine. 3—The kind of material. 4—Width and depth of cut. 5—Desired finish. 6—Degree of accuracy.

C-master Magnetic Support Model D-1

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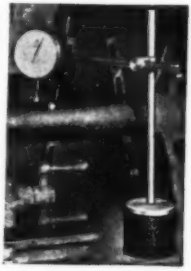

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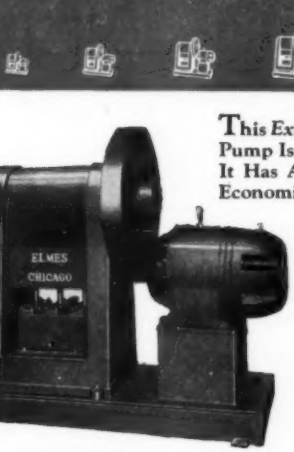

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FIG. 67—RULES FOR DETERMINING SPEEDS AND FEEDS

TO FIND	HAVING	RULE	FORMULA
Speed of Cutter in Feet per Minute (F.P.M.)	Diameter of Cutter and Revolutions per Minute	Diameter of Cutter (In.) Multiplied by 3.1416, Multiplied by Revolutions per Minute, Divided by 12	$\frac{D \times \pi \times R.P.M.}{12} = F.P.M.$
Revolutions per Minute (R.P.M.)	Feet per Minute and Diameter of Cutter	Feet per Minute, Divided by Circumference of Cutter in Feet (Diameter x 3.1416 ÷ 12)	$\frac{F.P.M. \div D \times \pi}{12} = R.P.M.$
Feed per Revolution (F.R.)	Feed per Minute and Revolutions per Minute	Feed per Minute, Divided by Revolutions per Minute	F. ÷ R.P.M. = F.R.
Feed per Tooth per Revolution (F.T.R.)	Feed per Minute and Number of Teeth in Cutter	Feed per Minute (In.), Divided by Number of Teeth per Minute (Number of Teeth in Cutter x Revolutions per Minute)	F. ÷ (T. x R.P.M.) = F.T.R.
Feed per Minute (F.)	Feed per Tooth per Revolution, Number of Teeth in Cutter, and Revolutions per Minute	Feed per Tooth per Revolutions Multiplied by Number of Teeth in Cutter, Multiplied by Revolutions per Minute	F.T.R.xT.xR.P.M. = F.
Feed per Minute (F.)	Feed per Revolutions and Revolutions per Minute	Feed per Revolution Multiplied by Revolutions per Minute	F.R. x R.P.M. = F.
Number of Teeth per Minute (T.M.)	Number of Teeth in Cutter and Revolutions per Minute	Number of Teeth in Cutter Multiplied by Revolutions per Minute	T. x R.P.M. = T.M.

R.P.M. = Revolutions per Minute
T. = Teeth in Cutter
D. = Diameter of Cutter
π = 3.1416 (Pi)
T.M. = Teeth per Minute
F. = Feed per Minute
F.R. = Feed per Revolution
F.T.R. = Feed per Tooth per Revolution

F.P.M. = Speed of Cutter in Feet per Minute

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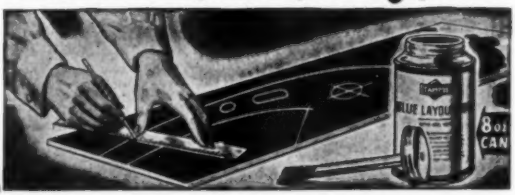

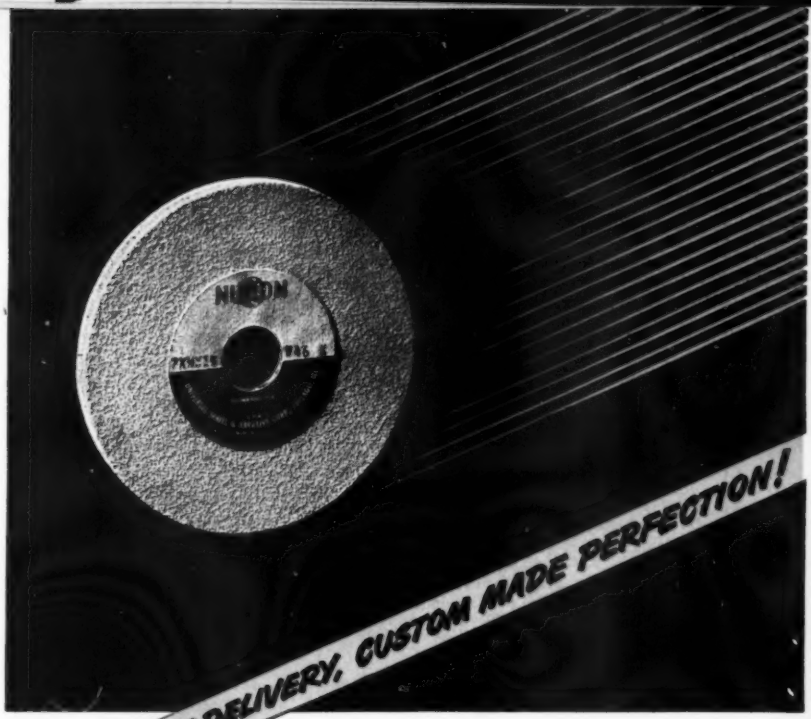

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FIG. 68—SAMPLE SPEED AND FEED CALCULATION

PROBLEM: Determine proper SPEED and FEED of a 5" diameter face mill with 10 High Speed Steel blades, milling cast iron.

A) TO DETERMINE SPEED DIAL SETTING (Cutter R.P.M.):

RULE: Divide the feet per minute (F.P.M.) by the circumference of the cutter, expressed in feet.

FORMULA: $\text{F.P.M.} \div \frac{\text{Dia. of cutter} \times \pi}{12} = \text{R.P.M.}$

From Chart 2 under H.S. in Cast Iron, 80 F.P.M. (range 50-80) is selected.

Therefore: $80 \div \frac{5 \times 3.1416}{12} = \text{R.P.M.}$

$$\begin{array}{r} 3.1416 \\ 5 \text{ in. dia.} \\ \hline 15.7080 \end{array} \qquad 12 \overline{)\,15.71} \; 1.31 \qquad 61.1 = \text{R.P.M.}$$

$$1.31 \overline{)\,80.00} \; 61.1 \text{ R.P.M.}$$

SHORT FORMULA FOR SPEED:

$$\frac{4 \times \text{F.P.M.}}{\text{Diam. of Cutter}} = \text{R.P.M. or } \frac{4 \times 80}{5} = 64 \text{ R.P.M.}$$

B) TO DETERMINE FEED DIAL SETTING (Feed in inches per minute = F):

RULE: Multiply feed per tooth per revolution by number of teeth in cutter and by the speed (number of revolutions per minute.)

FORMULA: F.T.R. x T. x R.P.M. = F (Feed)

From Chart 3 under Face Mill H.S. in Cast Iron a F.T.R. (chip load) of .012 is selected (range .010-.025). R.P.M. is 61 from speed calculation.

Therefore: $.012 \times 10 \times 61 = \text{Feed.}$

$7.32 = \text{Feed.}$

RESULT: For the 5" diameter face mill cutter with 10 High Speed blades, milling cast iron—

The SPEED dial setting is 61 R.P.M.
The FEED dial setting is 7.32 I.P.M.

NOTE: The speeds and feeds determined by mathematical computation are approximate and dial settings closest to these results (either higher or lower) are normally satisfactory as a starting point.

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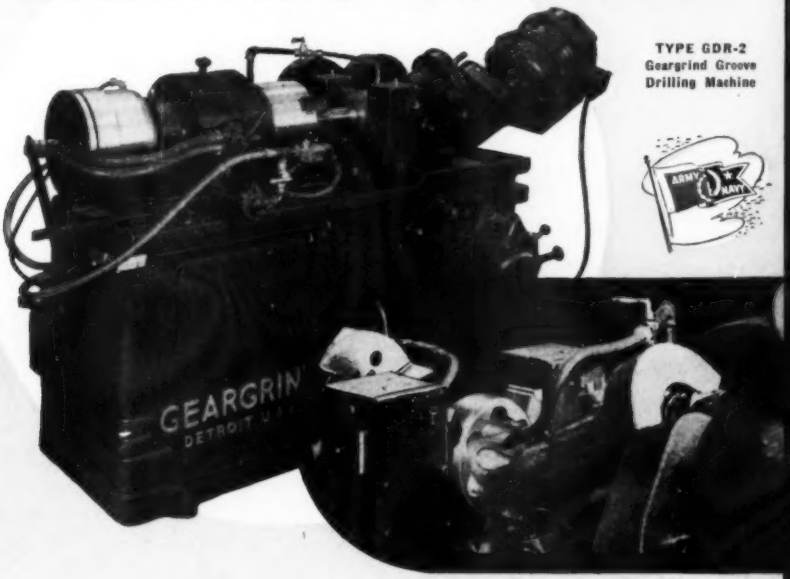

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This small shaper has found a permanent and dominating place in many nationally known shops, because of its exceptional merit, expressed in a grade of performance hitherto unapproached in facility of operation, high rate of production, and accuracy of work.

Primarily it is a high speed cutting tool. On 6" stroke it has a maximum cutting speed of 182' per minute; and on 12" stroke a high cutting speed of 120' per minute.

This 12" shaper is not limited to high working speeds alone; it has ample power at low speeds for forming tool cuts and other heavy duty work. Convenient arrangement of levers for the operator increase efficiency.

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HENDEY MACHINE COMPANY

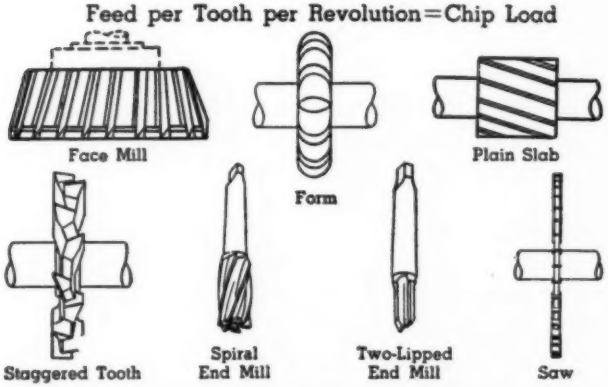
106 Summer St., Torrington, Conn.

The actual calculation of the proper feed begins with the use of the so-called chip load table as shown in Fig. 70. Here the thickness of each chip per revolution per tooth is given for various types of cutters working in various materials. Thus, a chip thickness or load of .010 to .015" can be used when milling cast iron with a high speed slab mill.

Since the operation determines the size of the cutter, generally speaking, the number of teeth in the cutter is available. With the number of revolutions of the spindle previously determined, as already described, it becomes possible to calculate the proper feed rate. This is done by multiplying the chip load by the num-

Fig. 69—A typical feed dial indicating the wide range of selection available to the operator.

FIG. 70—GUIDE TO CORRECT FEED SELECTION



Recommended Chip Load Tables

Type of Cutter	In Cast Iron	In Steel	In Brass Bronze Aluminum
Face Mill, H. S.	.010 to .025	Less 40%	Plus 50%
Slab Mill, H. S.	.010 to .015	Less 40%	Plus 50%
Slotting Cutter, H. S.	.006 to .012	Less 40%	Plus 50%
Form Mill, H. S.	.004 to .006	Less 40%	Plus 50%
End Mill, H. S.	.002 to .010	Less 40%	Plus 50%
Saw, H. S.	.001 to .003	Less 40%	Plus 50%
Cemented Carbide Face Mill	.008 to .012	.004 to .008	.010 to .016

In general, select the proper SPEED for work material and cutter; and then determine the feed, within the above limits, according to the cut and the power available or the finish required.

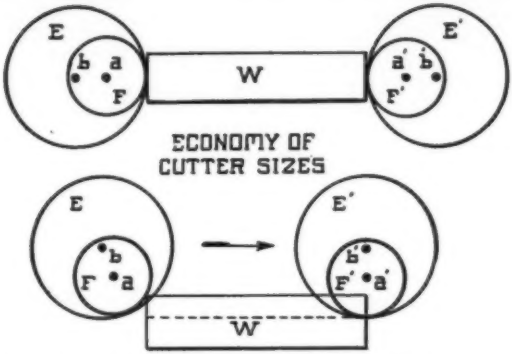


Fig. 72 — Economy is dependent upon the proper selection of cutters.

ber of teeth and in turn by the number of revolutions of the cutter. This results in a feed rate expressed in inches per minute. Once this is determined, the operator then turns the handle on the dial to the calculated rate.

Economy

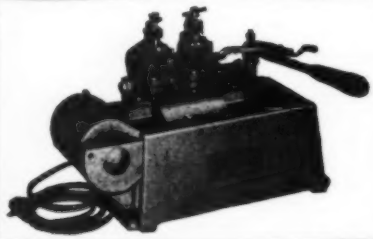
A word about economy follows logically after a discussion of feeds and speeds. Only too frequently, a beginner is inclined to think of economy in terms of feeds and speeds only. While these are important factors, economy is dependent largely upon:

1—Correct analysis and organization of the job.
2—Selection of suitable cutters.
3—Proper use of automatic cycles to reduce the dead time between cuts, etc.

Brief reference will be made to the important factor of analyzing and organizing the job. The operator should carefully study the blueprint and instructions accompanying the job. This will help in preparing a correct inventory of equipment needed for the operation, as well as its proper assembly. Unless this is done, the setup time for the operation is lengthened out of all proportion.

Economy is also dependent upon the proper selection of cutters. As indicated in Fig. 72, the smaller cutter for the milling of the workpiece "W" causes the table to travel from A to A′; whereas selecting the larger cutter "E", the table must then travel from B to B′. Thus, an unnecessary and additional distance of BA plus A′ - B′, has caused the table to travel so as to result in an uneconomical operation.

The use of automatic cycles, wherever possible, is recommended. In addition,



BAND SAW WELDERS

The No. 141 Bench Type Metal Working Band Saw Welder is available with or without grinder. Work can be annealed without removing from the Welder. Band saws up to ¾" wide may be welded.

1 KVA—110 Volt—60 Cycle—single phase—5 point heat control—1 point anneal heat—Weight 40 lbs. Let us send you further details.

Mfrs. of complete line of Spot, Butt, Seam, Flash, Projection and Special Welders.

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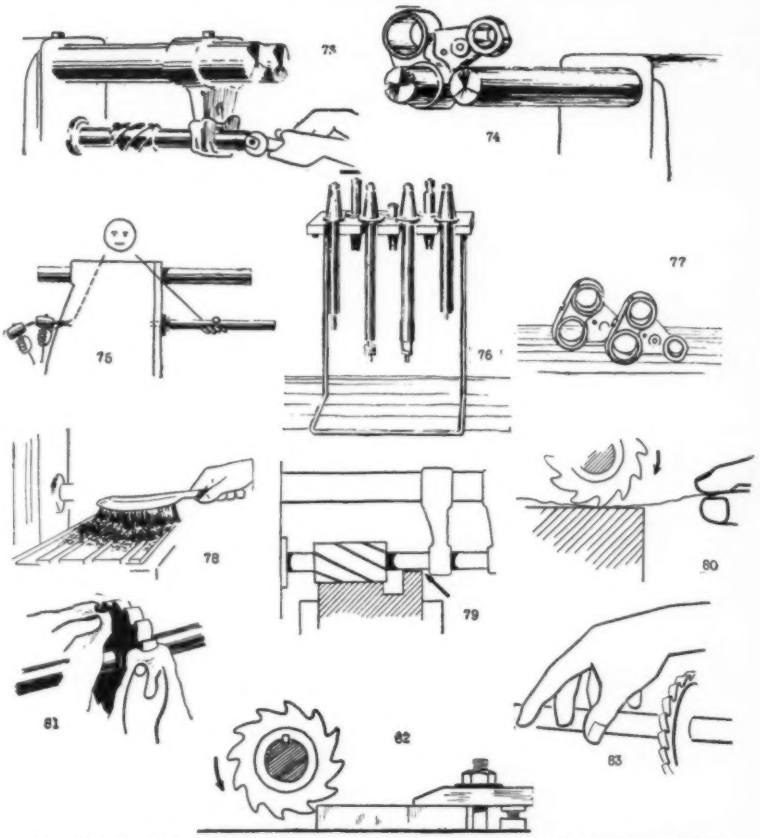

Figs 73 to 83—Here are some special points to watch in proper care of cutters, arbors and parts. Also a number of safety precautions, all of which are described in the text.

the placing of stops assists in reducing unnecessary travel of the table.

Disassembling the Setup

Proper disassembling of the setup is almost as important as making the correct assembly.

It is necessary to leave the arbor support in place, as shown in Fig. 73, when loosening the arbor nut, in order to prevent damage to the arbor.

It is not necessary to remove the arbor supports from the overarms entirely, as shown in Fig. 74, thus, saving time and possible damage to the equipment.

Fig 75 shows the necessity of properly supporting the arbor while passing the draw-in rod. Thus the arbor is prevented from dropping to the machine table and the floor, damaging both it and the equipment.

Arbors should be stored in suitable racks as indicated in Fig. 76. The arbor is an extremely delicate and sensitive accessory. It should never be laid on the bench or the rack so that its own weight may have a tendency to warp it out of shape.

When arbor supports must be removed, they should be handled as shown in Fig. 77.

SAFETY FIRST

The health and well-being of the operator is the first consideration. His safety is not only of first importance in his organization and with his superiors, but it should be his own first concern. It is the duty of every worker to operate his equipment and to perform his tasks as if his health and physical well-being came first.

Here are a few observations concerning the operation of a milling machine which will assist the operator in protecting himself:

Chips on any machine tool table or workpiece should never be removed with the bare hands. This is particularly true of milling machine chips, which are finer and therefore, more likely to enter the hand unnoticed and thus cause hand infection.

A brush, as indicated in Fig. 78, should always be used for removing chips from a milling machine.

Since the cutter on a milling machine rotates and the table carries the workpiece into it, care must be taken to prevent a setup in which a moving part will strike a stationary or rotating part. As indicated in Fig. 79, the operator should make sure there is sufficient clearance between the workpiece and the stationary parts of the machine to prevent damage to the equipment and injury to the operator.

A piece of paper is frequently used for setting the cutter and the workpiece in proper relationship. If this is done—and it should be avoided whenever possible—the piece of paper should be sufficiently long to prevent serious injury to the operator's fingers and hand. (See Fig. 80)

Cutters such as used on milling machines, after grinding, have dangerously sharp edges. When assembling such cutters on the arbor, the operator should use a cloth to prevent cutting his hand when making the cutter assembly. (See Fig. 81)

The relatively large amount of power available in such machine tools as the modern milling machine, provides heavy forces between the cutter and the workpiece. Obviously, if the workpiece is not rigidly and firmly held, these large forces will tend to move the workpiece from its correct position. Moreover, if the clamping is carelessly done, the cutter can easily disrupt the setup and cause serious injury to the operator. (See Fig. 82)

The operator is especially cautioned never to reach over a revolving cutter. The reasons are obvious and are plainly indicated in Fig. 83. The machine should be stopped first before performing any such an operation.

(To be continued)

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"heir" minded production men

See that kid in uniform? It's his first morning home. He's finished with his job of fighting a war. Now there is peace. But can it be peace if this kid — yours, perhaps — and millions more like him, face a "no help wanted" future? American business has the answer. It's sales. Sales make jobs. Production must promote sales . . . by making it better, faster, in greater quantity for less money, for more people. How about your productive "sales promotion" equipment? Your lathes, for instance? Will they turn to the tempo of *lowest cost post war production? A "maybe"* answer won't do. The boys coming back have a heritage coming due. It is largely up to "heir" minded production men to see that they get it . . . the opportunity to earn an honest living by honest work in support of the *real* American standard of life.

MEMO: *U. S. Department of Commerce predicts that if the war lasts through 1944, Americans will have accumulated savings amounting to $100,000,000,000. Be prepared for mass marketing. From now on business must reckon with huge masses of buyers.*

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"The LIE is my political weapon"

At the start of his activity, Adolph Hitler proclaimed to the world that his weapon was the LIE

—the all-out undiluted LIE

—and now see what happens to a structure founded on bosh:

(a) the theory of the blitz *blasted*

(b) the legend of invincibility *exploded*

(c) the infallibility of his "intuitions" *fizzled.*

He could have fooled a lot more people for a lot longer time, if he had only tried the trick of nursing along old truths—now turned into fallacies—but still adhered to by the unthinking majority.

For *Progress* has a way of flipping the FACTS of yesteryear into FLOPS almost overnight. The follower of an OUTDATED fact may easily find himself nursing a progress-blocking FLOP.

Here, Adolph, are samples
of yesteryear FACTS now turned FLOPS

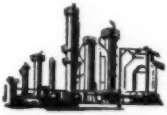
FLOPPED FACT 1:
"You can't produce all-welded ships" . . . . . .

....Recourse to arc welding has filled the seven seas with them.

FLOPPED FACT 2:
"You can't arc weld high-temperature, high-pressure piping" . . . . . .

....The one safe way is through recourse to arc welding.

FLOPPED FACT 3:
"You can't weld cracking stills" . . . . . .



....Without recourse to arc welding—our armed forces would be without high octane gas.

FLOPPED FACT 4:
"You can't produce army tanks with arc welding" . . . . . .

....Through recourse to arc welding—it's the only kind they're producing today.

FLOPPED FACT 5:
"You can't erect buildings by arc welding" . . . . . .

....Savings in steel and money are represented in thousands of structures of every type—through recourse to arc welding.

FLOPPED FACT 6:
"Railroad cars are taboo for arc welding" . . . . . .

....Watch them rolling the rails in every state—through recourse to arc welding.

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NEW!

ANGLE GAGE BLOCKS!

(FULLY PATENTED)

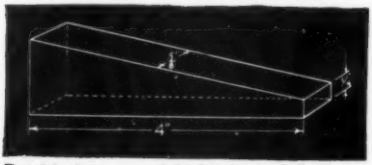
An absolutely NEW method for all precision angle measurement

Webber Gage Co.—largest manufacturer of gage blocks exclusively—proudly offers industry its latest achievement —WEBBER ANGLE GAGE BLOCKS. • Product of years of research and development, these blocks provide for the first time a simple, fast, sure means for precision measurement of angles—*at a cost within the reach of every shop.*

● A MILESTONE IN MEASURING ●

Facts about WEBBER ANGLE GAGE BLOCKS

SPECIFICATIONS



Furnished in sets of 14 blocks in 3 Series as follows:—

1st Series—Degrees—1—3—9—15—30—45
2nd Series—Minutes—1—3—9—27
3rd Series—Seconds—1—3—9—27

A complete set of WEBBER Angle Gage Blocks will yield any angle from 0° to 103°—a total of 370,800 angles—in steps of 1 second of an arc.

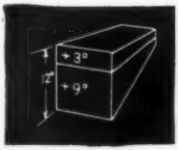
Working surfaces are optically flat—blocks wring together and adhere same as regular gage blocks.

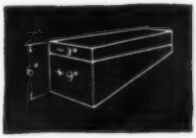
Every set includes a parallel and knife edge.

HOW THEY ARE USED

Webber Angle Gage Blocks are used for precision measurement of angles in the laboratory, inspection room, shop, etc. To obtain a desired angle, blocks are selected from the set which when added—or *subtracted*—will yield that angle. These blocks are wrung together and will adhere just as with gage blocks.

EXAMPLE: To obtain an angle of 12°—take the 3° and 9° blocks and wring them together with the large ends marked "plus" adjacent. Thus, 3° plus 9° equals 12°. To obtain an angle of 6° take the same two blocks (3° and 9°) but wring them together with the "minus" end of one adjacent to the "plus" end of the other. Thus, 9° minus 3° equals 6°.





Very little study is required to comprehend how 2 or more Angle Gage Blocks may be wrung together to produce any angle in degrees. The blocks in minutes and seconds are combined in the same manner and added on.

In the minute and second series only 4 blocks are needed which will combine to form up to 30 minutes. If 32 minutes is required—simply add to the original measurement one more *degree* (60 minutes). Then subtract 28 minutes from this—leaving 32 minutes which was required.

No mathematical computation is involved in using WEBBER Angle Gage Blocks. With each set is furnished a table showing which blocks to use and how to combine them to get any angle required. Precision angle measurement is reduced to an extremely simple, fast, sure operation.

If after long use or extremely hard wear, they become damaged or inaccurate, they can be returned to WEBBER Gage Company, and restored to "like new" condition at a modest cost.

Absolute accuracy is assured since proof of the accuracy of the blocks is contained within the blocks themselves. This is true of gage blocks for linear measurement. Example — wring together any number of gage blocks to make a size equal to that of a single block. Then the group of blocks will check perfectly with the single block. By this principle—if the largest block in the set is correct then all the other blocks in combination checking with it must also be correct.

This principle applies in checking WEBBER Angle Gage Blocks inasmuch as the starting place is a straight line (instead of the largest block in the set as above) and a straight line can easily be checked by optical means.

WEBBER Angle Gage Blocks are guaranteed accurate to within $\frac{1}{5{,}184{,}000}$ part of a circle.

Such accuracy, obviously, cannot be checked with the usual shop tools any more than regular gage blocks can be checked with a micrometer.

A limited number of sets of WEBBER Angle Gage Blocks are now available. Literature and prices furnished on request.

Webber GAGE COMPANY

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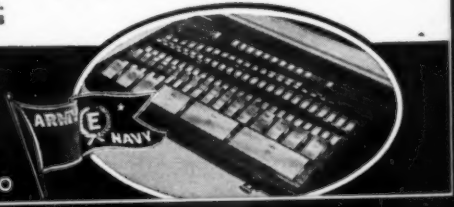

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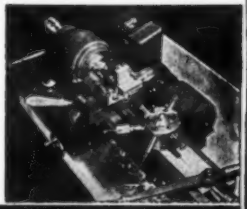

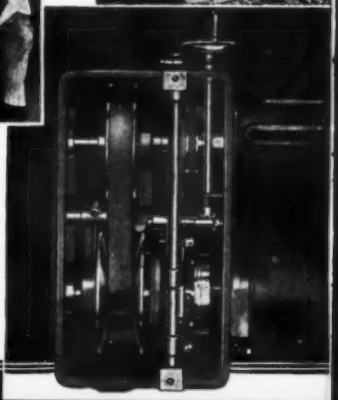

THE first tool of its class with built-in Motor and speed changing mechanism (patented). Marvelously compact; nothing under the bench; no special bench or cabinet needed; even bolting down unnecessary.

Simply moving control lever to right engages the clutch, vertical position releases; moving to the left instantly brakes the moving spindle.

Standard (tool room) Model has time-tried double taper spindle bearings 156 to 2200 r.p.m.—the best for sustained accuracy.

High speed (manufacturing) Model fitted with best precision pre-loaded anti-friction bearings, 260 to 3500 r.p.m.

Both have 40 inch bed, 9 inch swing, 20 inches between centers: either ¾ or 1 inch collet capacity. Take regular STARK Attachments collets and chucks. This Stark (patented) built-in drive, integral with the Lathe itself, employs a ½ h.p. geared ball-bearing motor drive through a disc clutch, and through V belts to the headstock, giving any split speed at the turn of the small hand wheel in front of operator.

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IT OFFERS A *Newer-Quicker-Better* WAY TO AN EXPEDITED TOOLING AND A LOWERED PRODUCTION COST

A Drill Jig — all designed, already made, all-ready-to-use, it smooths out tooling problems in a hurry; saves HOURS of tooling time; gets you into production DAYS sooner.

Amazingly speedy—loading and unloading—it definitely does speed production.

There is no doubt—if you are engaged in drilling and milling operations, this new production tool can be of major benefit to you—even to the extent of replacing your box-like jigs.

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so that, when the necessity for quick tooling and the demand for a lowered production cost is at hand, you can *snap into it* without a moment's loss of time.

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embody features that make them ideal tools for general purpose work. Simple yet rugged in construction, they are positive in opening and easily adapted to practically every thread cutting operation within their capacity. All parts are of hardened steel, ground to absolute accuracy. A minimum number of parts reduce wear and make for long life.

Style T Die Heads are made in capacities from ⅛" to 2". Style B Die Heads may be had in capacities from 2½" to 7". Thus, a small investment enables a shop to handle a wide range of thread cutting jobs. For more complete information send for Bulletin M-123.

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MODERN TOOL WORKS

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ROCHESTER, NEW YORK

Conservation in Filing

By H. J. CHAMBERLAND

MATERIAL conservation, a primary objective in all war plants, is not solely directed to reducing the chip pile but to all tools producing the chips as well. Files, regardless of type are made of costly and scarce material as is the case with any other metal-cutting tools. It is therefore imperative that efficient filing methods be applied in each case to extend tool life for deserving and rightly allocated distribution.

It is safe to assume that hand files and jig files, which mechanically reproduce the hand stroke, will never be discarded. I refer especially to hand files because to them, numerous artistic applications are forever bound. The fact remains that both types have reciprocating movements with only the push-stroke cutting. The return stroke if not skilfully controlled, is far more injurious to the fine edges than the cutting stroke.

On the contrary, the continuous filing principle involves no return stroke. Hundreds of sharp teeth cut steadily downward, uniformly and precisely. Teeth of band files stay sharp longer because the operator needs little experience to determine feed pressure and correct velocities are automatically provided.

A correctly selected file band for a specific application is good for 100 to 150 hours of efficient cutting. It cuts much faster than hand files and more than twice as fast as jig files. Therefore, it makes sense that the life of hand and jig files can be surprisingly increased if used only for operations not within range of continuous filing. As one manufacturer puts it:—"Until recently we had approximately 25 operators, men and women, regularly filing by hand. Since using four band filing machines, we put 15 men on more important work and our stock of

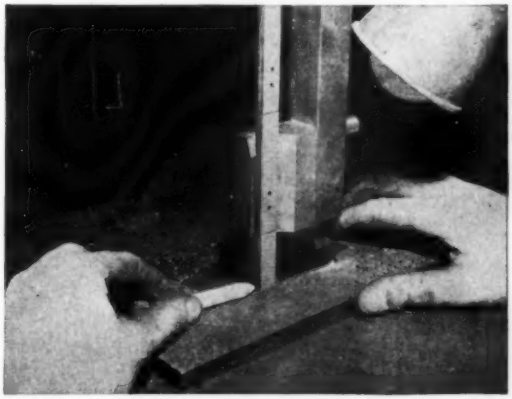


Fig. 1—The life of a correctly selected and tracking band file, when used at proper speed and feed for material being cut, is from 100 to 150 hours.

Fig. 2—It is now far more economical to band file on a specially designed unit so not to delay production of contour saws.

hand files will now last from 12 to 18 months."

What is a file? What does it do? Does it produce chips? Does it generate heat?

Many questions come to mind when speaking of files because of man's long acquaintance with this most useful tool. However, many of its peculiarities still remain a closed book to many users.

It is interesting to know that iron files of the Gallo-Roman period were quite similar to those used to-day. File teeth were so cleverly hand cut until about 1800 that not until then were some files machine cut.

Expert hand filing always has been and still is recognized as an art because only thru extensive practice can the "dragback" and "belly" be avoided. Band filing machines were introduced some 40 years ago as a means of substituting mechanical means for experience, to some extent. It is, however, only within recent years that the procedure has received due recognition. The outcome of present-day equipment is a combination of expert

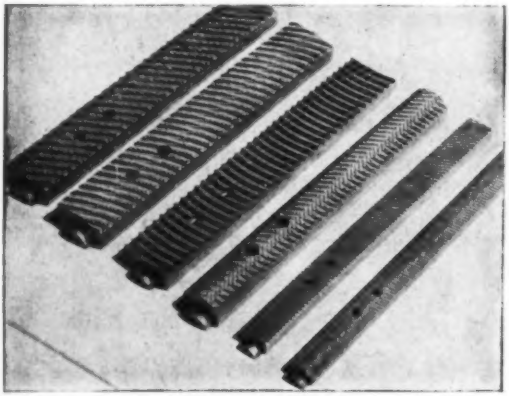
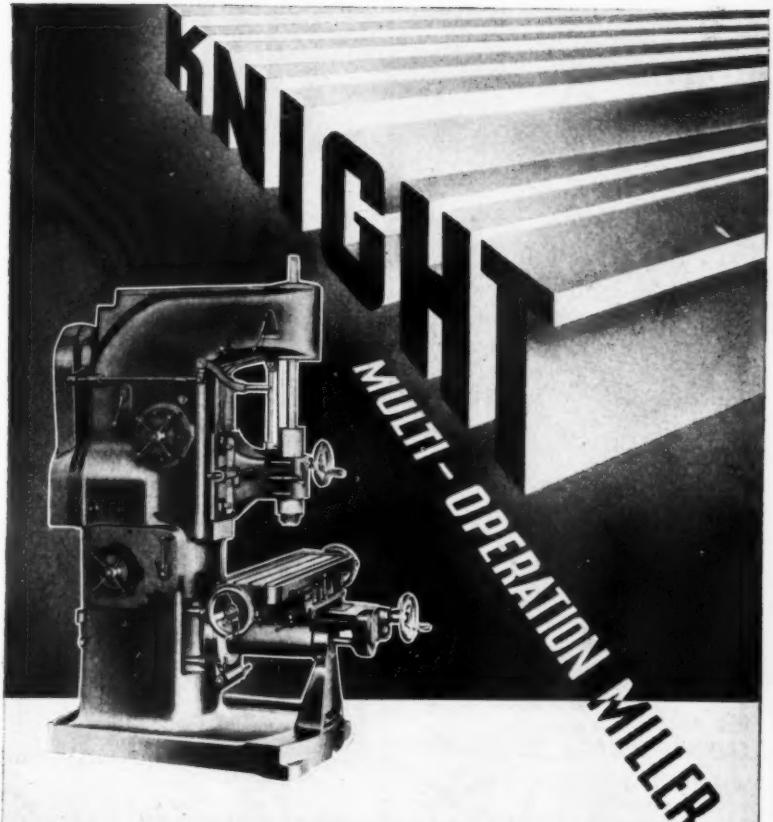


Fig. 3—File segments as they appear after sandblast to impart maximum sharpness to cutting edges.



This milling machine will perform and accurately produce at all speeds and feeds to full capacity.

The KNIGHT MILLER will save you valuable hours on many jobs. A special swivel and tilting table feature saves the use of angle plates, cutters and special fixtures.

The No. 40 has a wide range of capacity fitting it for many jobs and uses. There are 16 different spindle speeds, also 16 table feeds available.

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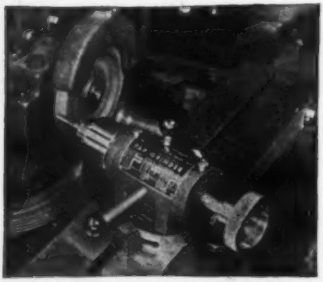

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- Built-in chamfer protractor.
- Simple shifter for 2-3-4 flute taps.
- Variable relief thru adjustment screw.
- Easy - to - follow chamfer diagram on index plate.
- Capacity to ¾" hand tap.

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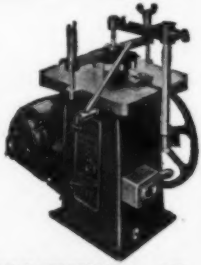

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engineering and modern manufacturing methods urged by the emergency for more speed and higher precision in filing.

A good file, like any other tool, is a blend of many ingredients such as fine materials, expert workmanship, modern inspection methods and above all, research. Band files surely cannot escape any of these essentials because the segments, expertly mounted on a flexible Sweedish steel band, must be as identical as a thousand steel balls from the same lot.

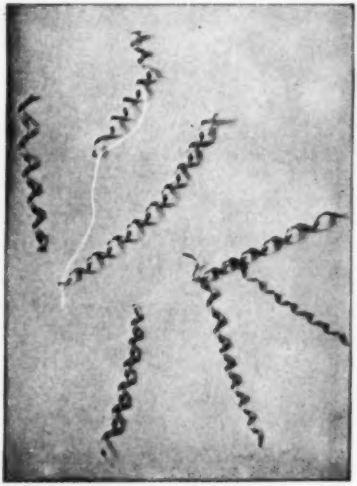

Fig. 4—Enlarged view of steel chips as produced by the continuous filing method.

File teeth are not actually "cut" but are formed by chisel action, so there is no waste material, even in their making. The ridges are spaced with mechanical regularity to provide the desired number of teeth per inch. Additional ridges are cut at varying angles, depending on the pattern of cut. The teeth and intersections, of course, represent a range of mountains divided by deep valleys and canyons.

A single series of ridges forms a single cut file. Band files are, however, double

Precision Heat Treating at Sonotone

In the production of intricate specialized parts Sonotone use an atmosphere controlled Hevi Duty Hinged Tube Furnace for precision heat treating — Hevi Duty Tube Furnaces are detailed in Bulletin HD-1236 — send for your copy.

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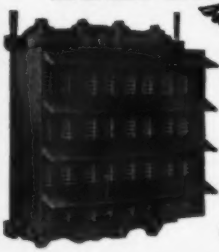
Install a UNIT HEATER



that will stand wear as long as the pipes furnishing steam or hot water to it!

Cast Iron GRID Unit Heater is built to last for years — to last longer than any other types of heating equipment. Its condensers are made in ONE piece—no soldered, brazed or welded connections to become loose—no leaks—no breakdowns—and no maintenance expense.

Engineered and tested to operate with either steam or hot water, up to 250 lbs. steam pressures, each "fin" heating section is made of high test cast iron to cooperate with the war effort. No electrolysis to cause corrosion . . . no heating failures. In the GRID unit heater no effort is spared to make it a high quality product, and we're constantly working on improvements to make it better. Catalog and capacity tables are yours on request.

D. J. MURRAY MFG. CO.

WAUSAU, WISCONSIN

GRID

cut by repeating the process with further variation in angles. The results are more "peaks" or teeth for faster, cleaner and smoother cutting. The efficiency of file segments, to a considerable extent, depends on expert machining and scientific heat treating. Primarily, segments of each band must be perfectly matched to cut as if the assembly were a single file. Too soft a segment will slip by the work without exerting any cutting pressure. If too hard, the points may break, because the delicate tooth points have supersharp cutting edges produced by a sand-blast operation.

Fig. 5—How file segments interlock as one, once mounted on flexible steel band and actually cutting.

File bands, made up as they are of matched three-inch file sections, become doubly interesting when we consider what they are expected to do when ready for delivery. File teeth in action are very much like saw teeth. A small chip curls up before each of the tooth points, is dropped when clear of the work and the segment containing that particular tooth circles around for the next "bite".

THE CINCINNATI SHAPER CO.

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Fig. 6—For an extra fine finish, the file band is replaced with polishing band of desired grit.

This comparison may be continued. It is possible actually to "saw" thru a piece of metal with a continuous file. It is true that even a ¼" file band will produce a kerf much wider than a band saw, but filing is nevertheless a matter of chip production and subject to the same rules and problems as sawing.

It must be remembered also that heat has a profound effect on file teeth and on the surface being filed. Clean cutting is very essential since the heat produced by an inefficient file only tends to destroy its remaining effectiveness. A heated surface surely becomes a glazed surface. It is obvious that material, easily filed with a coarse cut file, is quite impregnable for the heated and chip-crowded teeth of a fine cut file.

Selecting the Proper File

There are two distincts cuts of file bands, each having a definite application. Bastard cut files are most widely used

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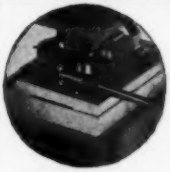

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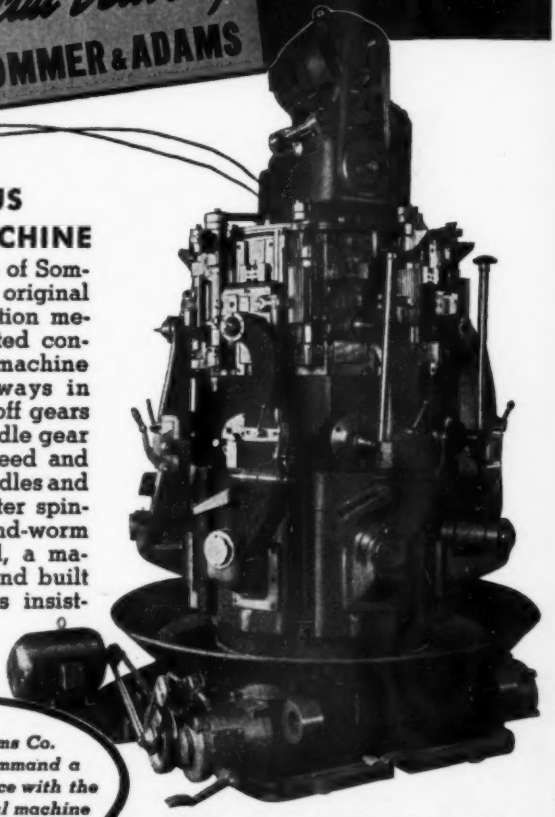
Another example of Sommer & Adam's original design—an 8-station mechanically operated continuous milling machine for milling keyways in axle shafts. Pick-off gears in index and spindle gear boxes change speed and feed of cutter spindles and turret index. Cutter spindles are worm-and-worm driven. All in all, a machine designed and built to answer today's insistent call for production *with accuracy.*



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since they are well adapted for general use on most metals. Mill cut files (not milled) provide the finishing touch for a precision-smooth surface.

Most recently, a fast-cutting production file intended for cast iron, non-ferrous metals, aluminum, brass, copper and plastics has been developed and is known as the "short angle file". This file is non-clogging, cuts smoother and leaves a higher finish than that produced by regular coarse cut files. Laboratory tests have shown as much as 75% increase in cutting rate in connection with the materials mentioned.

There are three widths, three shapes and a variety of teeth per inch from 10 to 24. Consequently, there is no excuse for not using the correct file rather than unduly shortening the life of another. The variation in teeth per inch determines the effectiveness of a band on various materials. The coarser the file, the more material it will remove with less tendency to become loaded with chips.

The operator can better determine the work pressure to use in each case. As a general rule, pressure can be exerted to a point below that of stalling, with no detrimental effect on the file teeth. Increased pressure does not necessarily mean faster cutting, so correct pressure is more effective in the long run.

File bands are, of course, operated at much lower velocities than saw bands. The range is from 50 sfpm for tool steel to 100 and 125 for cast iron and plastics. Finish filing calls for a light work pressure but no change in speed. A small mirror, located on the machine table at the rear of the file band support, aids the operator to observe results.

A 16 to 20 tooth file at 50-60 sfpm works exceptionally well on stainless steels. These alloys are tough. A light pressure is necessary to prevent generation of more heat than can be dissipated. With tool steels, there is less tendency to heat under pressure but the feed should be regulated so the teeth will not slide over the work without cutting. Twenty teeth files for general cutting and 26 teeth for precision finish, at 50-60 feet, are general recommendations.

Nickel silver and monel metal require very coarse file teeth to prevent clogging, since they lack the brittle hardness of the more dense steels. Both may be cut faster than tool steels with a velocity of 75 to 100 sfpm.

To file copper, brass, bronze, duralumimin and aluminum, the short angle file should be used. A 12 tooth at 100 feet will serve for most purposes. Phosphor bronze and beryllium copper require slightly lesser speed. Non-metals may be filed at 125 sfpm but in this case, as with most non-ferrous metals, the main thing is to keep the file cutting. The teeth gouge out large chips which must be disposed of immediately, or the file will soon load up and refuse to cut.

In conclusion, I dare say that still more attention should be diverted to continuous filing. First cost should be no barrier since band filing units are about equal in price to the average bench screw-cutting lathes. Furthermore, files of any type are far from plentiful as yet and every band filer can conserve a considerable number of hand files for mechanics who really know how to use them, and where they can do most good.

(Illustrations—Courtesy Continental Machines, Inc., 1300 S. Washington Ave., Minneapolis, (4) Minn.)

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mounted on permanent magnet with adjustable angle device

Models M-L-1, M-L-3 and M-L-4 are specially designed to aid and speed up inspection and assembly of intricate mechanisms. They are powerful, large, handy. Their magnetic base will instantly attach itself to any metallic part of machine and firmly hold the lens at any angle desired.

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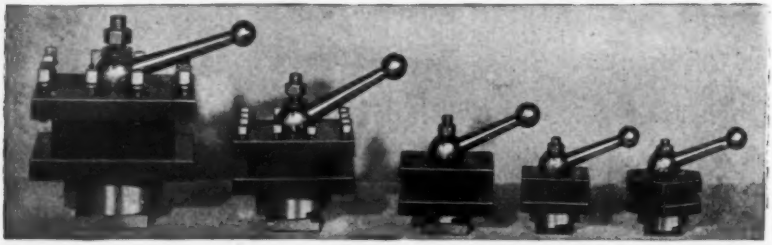
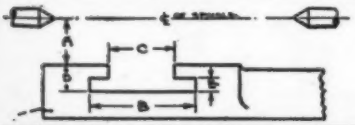


"A" Dimension range (from diagram on this page)	Model 6-S	Model 4-S	Model 3½-S	Model 2½-S	Model H
	2"—3-1/8"	1-9/16"—2-1/2"	1-1/8"—1-3/4"	7/8"—1-5/16"	7/8"—1-5/16"
Lathe Swing	16" swing & up	13" to 16" swing	10" to 13" swing	Bench Lathe	Bench Lathe
Maximum tool bit size	1" or 1-1/4" 1-3/8" toolholder for 3/8" bit (Where no tool bit size is specified, turret will be furnished for 1 inch tool bit)	3/4" or 5/8" (Where no tool bit size is specified, turret will be furnished for 5-8 inch tool bit)	1/2" Sq.	3/8" Sq.	3/8" Sq.
SPECIFICATIONS	4 tool 12 position 6" square Packed in carton Shipping Weight 35 pounds	4 tool 12 position 4" square Packed in carton Shipping Weight 12 pounds	4 tool 12 position 3-1/2" square Packed in carton Shipping Weight 8 pounds	4 tool 12 position 2-1/2" square Packed in carton Shipping Weight 4 pounds	6 tool 12 position 2" Hex Packed in carton Shipping Weight 4 pounds
	Price . $99.00	Price . $49.50	Price . $35.00	Price . $23.00	Price . $25.00



Make of Lathe and Size	A	B	C	D	E	Maximum tool size desired

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- 3 positions for each tool
- Carburized hardened steel construction
- Mounts rigidly in compound T-slot
- Keeps setting accurately
- Indexing is self-contained. Eliminates all chip interference

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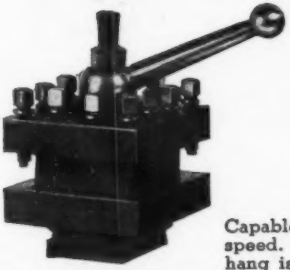


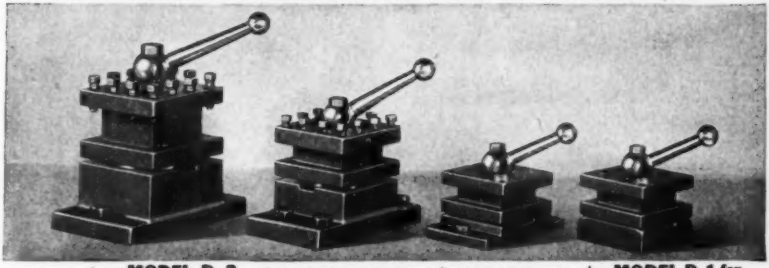
SPECIFICATIONS	HD-1	HD-2
Size of turret block	4-1/2" Sq. 3" thick	6-1/2" Sq. 4-1/4" thick
Range of tool slot height	1" or 1-1/4"	1-1/4" to 1-3/4"
Tool Size Range	3/4"—1"	1"—1-1/2"
"A" Dimension Range	2"—3-1/4"	3"—4-1/2"
Maximum "C" Dimension	2-3/4"	4"
Price	$99.00	$130.00
Shipping Weight	20 lbs.	45 lbs.

Capable of taking the strain of hogging cuts under high speed. Designed to mount maximum tool bits. Tool overhang is cut to minimum in these heavy duty models by the tools being mounted directly over the base of the turret. This increases the tool rigidity, permitting a heavier cut which reduces lathe time. 12-position tool indexing adds versatility to the rugged design of this accurate, cost-saving tool.

Models HD-1 and HD-2 can be shipped from stock with semi-soft base which can quickly be adapted to your lathe. Two weeks required for turrets fitted from specifications. When ordering turrets to specifications please furnish all dimensions shown on the lathe specification chart. Be sure to specify maximum tool to be used.

ENCO CROSS-SLIDE TURRETS

for Turret Lathes and Screw Machines



	MODEL D-3 for HEAVY DUTY	MODEL D-2	MODEL D-1	MODEL D-1 for LOGAN TURRET LATHES
Size of Turret Block	4½" square 3" thick	4" square 2¼" thick	3½" square 1¾" thick	3½" square 1¾" thick
Tool Size Range	up to 1¼" tool or 1⅜" toolholder for ⅞" bit	⅝" or ¾" tool	⅜" or ½" tool	⅜" tool
Price	$129.00	$79.50	$59.50	$52.50
Shipping Wt.	35 lbs.	20 lbs.	11 lbs.	9 lbs.

ENCO Cross-Slide Turrets for Screw Machines and Turret Lathes increase the tool capacity of the cross-slide 4 to 1. Each of the 4 tools mounted in the turret block has 3 different working positions. Each of these tools may be used for more than one operation reducing set up and grinding time. The base is bolted rigidly to the front of the cross-slide and keyed in place. The turret block and center post are carburized hardened steel and designed to give long and accurate service with minimum care.

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Trends ON THE PRODUCTION FRONT

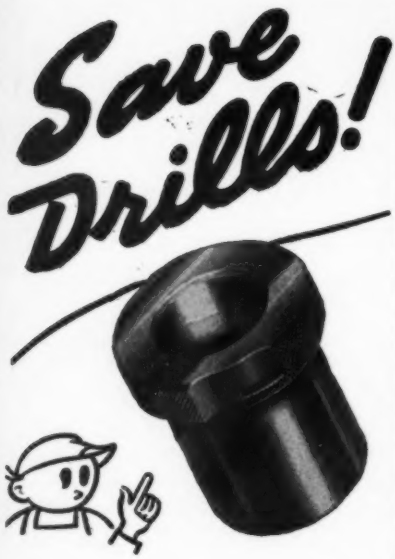
CARBIDE MILLING OF STEEL

THE milling steel and its alloys with carbide tipped milling cutters is attracting so much deserved attention that this interesting example, shown in Fig. 1, is presented.

This relatively new technique permits surface foot rates eight to 10 times those possible with other cutting materials. It might be better to put it this way:—the use of carbide tips makes necessary high spindle and, therefore, high peripheral rates. It follows immediately that the feeds must be correspondingly increased if a reasonably thick chip is to be cut by each tooth. Finally, the carbide milling of steel permits milling without the benefit of coolant. In fact, removing metal "dry" with this technique is apparently to be preferred to the "wet" method.

Carbide tips will successfully mill steel, even in the hardest brackets—it is being milled as hard as 400 Brinell—if those tips are set at a negative angle as is clearly evident from an examination of Fig. 1. Both the helix and rake angles in these face mill cutters, used for a straddle milling operation, are seven degree negative. With such a setting of the cutting tips, the cutting forces are directed against, not the fragile and unsupported edge, but that portion of the tip which is well supported. Tungsten carbide, in its various commercial forms, is extremely strong in compression but relatively weak in shear. If positive angles were used in cutters for the milling of hard ferrous materials such as steel and its alloys, the tips would quickly

Fig. 1—High Speed Milling demands rigidity of set-up. Note that in this operation, arbor support is set as close as possible to the cutter assembly. Vise holding the work piece is located as close as possible to the column face.



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break down and the short cutter life would make such operations uneconomical.

In the operation pictured in Fig. 1, the cutter bodies are of Meehanite, as manufactured by the Grayson Mfg. Co., Monrovia, Cal. This material provides a cushion for the tips because of its deadening qualities. The tip material, in this instance Kennametal KH, is brazed by induction heating to the body. This method of tip brazing is preferable. Brazing is more uniform and, therefore, more tenacious; the heat of brazing is concentrated at the tip and, therefore, localized in the body. Thus the bore is less likely to be distorted and the quality of the material in the body undisturbed.

These cutters are 6" in diameter with the body approximately 1¾" thick. The coarse pitch of the teeth is significant and, in this method of milling, necessary as will be explained presently. The spindle speed of 380 rpm is equivalent to 600 surface feet per minute. This high peripheral speed is feasible and makes possible good cutter life and high output of pieces between grinds.

A thick chip is an essential to good operation, particularly in the carbide milling of steel. Hence an .008" thick chip, or chip load, has been chosen for this job. Thus in each revolution .064" of metal is removed. In 380 revolutions 24" will be removed. Hence the feed rate is 24" per minute. Since this metal is plow steel, Brinelling at 210, this operation represents an increase over the traditional milling procedure, of something like 600%. If high speed steel cutters were employed for this straddle milling operation, a surface foot rate of 70'-80' and a feed rate of 4 to 5" is considered good practice.

Approximately .125" of metal is removed by each cutter. The finish is claimed to be superior to that possible with other methods or cutting materials. In fact, grinding operations are frequently unnecessary following the milling with carbide cutters. It is said that finishes equal to 20 to 23 micro-inches are possible as measured by a profilometer.

It is obvious now that a coarse pitch cutter is necessary in this procedure. If the customary 14 teeth were employed, as they would be, using high speed steel, the feed rate obviously would be so high

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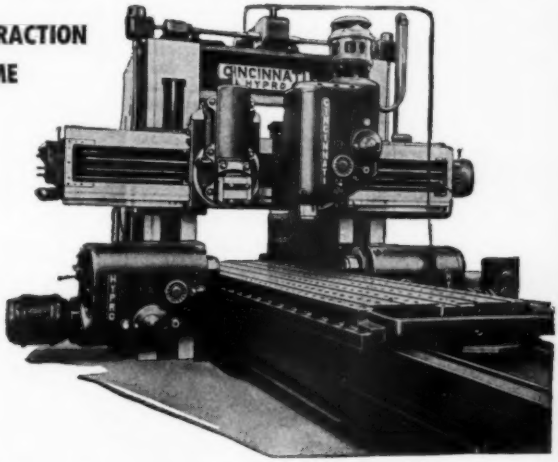

• The heaviest machine in the plant of a large machine tool manufacturer is this Cincinnati Hypro Combination Planer and Milling Machine. Because of the rigidity of the machine it is possible to use sintered carbide cutters of unusually large size. The vertical and horizontal cutters rough and finish grinder bed castings.

• There is also available without removing the casting from the machine, the planer head shown on the left above. This head is used for large, multiple tool planing, a feature which has unlimited possibilities.

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that reasonable power requirements in machine tools would be far exceeded. In this instance, 14 teeth would result in a feed rate of 43" per minute. Obviously, the power under these conditions would be entirely out of proportion to the size of the machine required for such an operation.

This illustration, Fig. 1., presents clearly one of the essentials to good results under this procedure. Rigidity of set-up is always a requirement of good machining. But more so with carbide cutters. Vibration is the worst enemy of carbide and hence the method of setting up the job, as well as the cutters must be given first consideration. Note that in this operation, an arbor support is set as close to the cutter assembly as is possible. And the vise holding the workpiece is set as close to the column face as possible. This results in a rigid support for the cutters; the arbor will not spring under impact of the cutting forces—at least such distortion will be reduced to a minimum. If the job permits, the workpiece should be so held that the cutters are closer to the top of the vise or fixture. The specifications of the job, in this instance, necessitated holding the workpiece as shown.

In addition, a large flywheel has been attached to the rear of the spindle of this machine, providing a cushioning of the impacts resulting from the relatively coarse pitch cutters.

A final word should be added regarding the grinding of milling cutters, particularly, as used for the carbide milling of steel. Unless the teeth, in the periphery, are all set in the same circle to within .0002", cutter life is reduced appreciably. The high teeth assume an undue share of the job of removing metal and thus break down quickly. Meanwhile the "low" teeth drag along and are quickly abraded by friction, which is one of carbide's most effective enemies. The edges of the tips on the cutting face should

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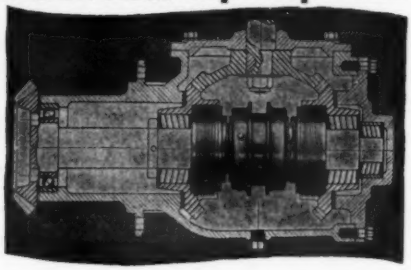

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also be indicated before being sent out on the job. High edges on this surface will result in poor finishes characterized by scratches.

The carbide milling of steel presents a revolution in the art of metal cutting and is destined to be one of the most important factors in post-war industrial activity. In an early issue, high speed milling of dural will be discussed. "High speed", in this revolutionary procedure means peripheral speeds as high as 20,000 surface feet per minute.

TRENDS IN INDUSTRY

FINISHED parts in the form of plastics, die castings and from powder metallurgy technique are certain to assume a tremendously important part, even quantatively, in the post-war era. Predictions have been and continue to be made about methods and techniques which obviously originate in the over imaginative minds of the popularizers of scientific and industrial events and phenomena. It is not necessary to enter into this, somewhat unfortunate, aspect of the progress of these three fields. For the seasoned reader of technical trade journals, it is unnecessary to point out the obvious limitations of any technique. No one method or material immediately and entirely supplants another. The casting of any part or device in a permanent mold, such as plastics, die castings, and powder articles require, immediately limits production to articles whose demand permits mass manufacture. The cost of the molds imposes economic limitations that simply will not listen to the exaggerated statements of the uninitiated or the popular writers.

And yet the field for these three, namely, plastics, die castings and powder metallurgy are destined to represent important sectors of American industry in the years to come.

What then will be the impact upon the whole of the American industrial scene? Since the making of the molds is the most important—and expensive—factor in all of these fields, equipment, methods, devices, materials and personnel for the making of the molds will necessarily receive increasing attention.

THE *Springfield* PRECISION LATHE

Tool Room Lathes are equipped with lead screw reversing mechanism, producing right and left hand threads and feeds. Has automatic stops for both lead screw and feed rod. Oil pan is also included as regular equipment. Bed constructed of High Test Nickel Chrome Gray Iron.

Gear box is tongued, grooved and bolted to front of bed and is the enclosed type to exclude dirt and chips from gears. Wide gears and heavy shafts with ball and bronzed bearings used throughout.

36 changes of threads and feeds are obtained, and in connection with the reverse gears, either right or left hand threads can be produced without the use of wrenches.

Massive tailstock, designed and constructed with long bearings on bed, is commensurate with the powerful headstock. All bearings and ways are oiled from one well.

Regular equipment includes large and small face plates, tool posts, steady rests and all necessary wrenches. Motors are located in large cabinet leg under head stock connected to machine by either V belts or silent chain drive.

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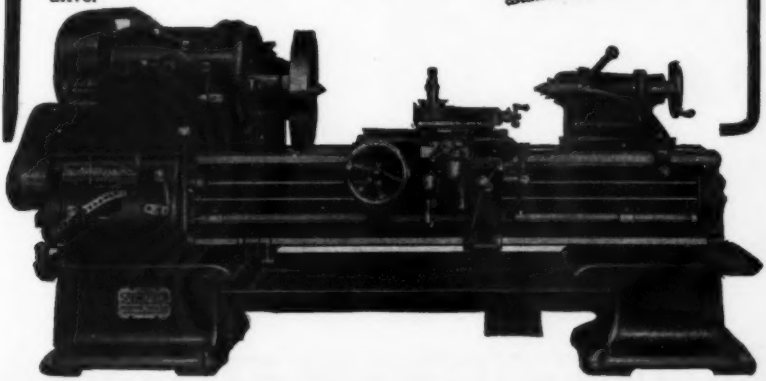

THE SPRINGFIELD MACHINE TOOL CO.

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Originally, the cavities in molds were machined largely with the aid of the drill press and the milling machine, followed by an infinite amount of painstaking and skilled hand work, such as scraping, filing and polishing. Today we have the pantagraph, hand and automatic duplicators and the rotary head milling machines which have lessened greatly, the amount of hand labor and made accurate tolerance finishing economical and feasible.

It is now possible to trace from a model exactly the shape and outline in a die block. It is even possible to transfer a blue print directly to metal without the aid and assistance of a model. These techniques are bound to be developed, augmented and improved. Will the future permit tracing with the aid of an electric eye the outlines and details of a drawing and so reproduce quickly and accurately in the form of a cavity the desired mold or die? Whatever direction the trend of the future takes in this particular corner of industry, the emphasis is certain to be placed on die and mold making machinery. These three fields of plastics, die castings and powder metallurgy will advance only as rapidly as the art of mold and die making advances. Any reduction in the cost of making the necessary molds and dies immediately increases the possible uses of parts made by these techniques.

Hence machine tool equipment for these fields will receive a significant impetus in the days that are ahead for American industry. But there must follow in this procession of machine tools, materials for the making of dies, cutters and cutter materials for the machining operations, grinding equipment—abrasives and grinders—for the accurate conditioning and re-conditioning of these tools and, finally, but by no means the least, the trained personnel for this increasingly important sector of industry.

All of these will be considered, briefly, insofar as they represent trends or movements, in the future pages of this magazine. For an understanding and appreciation of the trends of today is a necessary element in the continued and future success of going and projected industrial undertakings.

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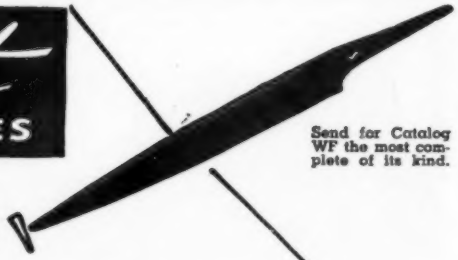
SWISS FILES



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B—Hardened Cryst-O-Flex for metal forming.

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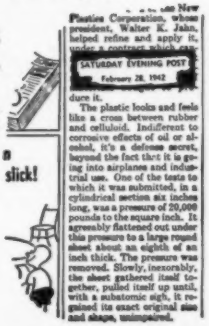
1⅞"	24 oz.
1⅞"	2 lbs.
1¾"	8 oz.
1¾"	17 oz.
1"	5 oz.
1"	8 oz.



SATURDAY EVENING POST

February 28, 1942

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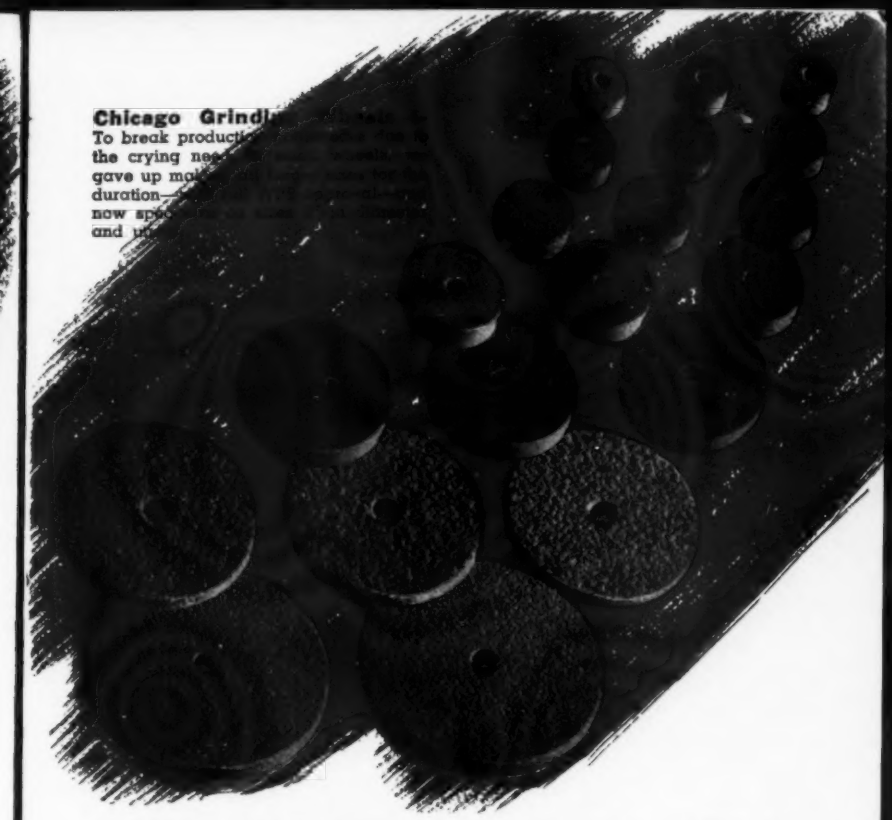

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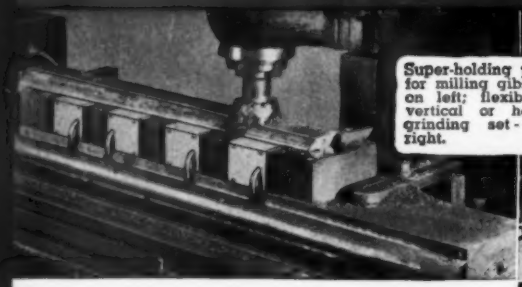

Super-holding power for milling gibs shown on left; flexibility for vertical or horizontal grinding set-ups on right.

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Toggle Clamps Speed Production

By H. D. ROBESON

EVERY Tool Engineer and Production man is highly interested in using simple fool-proof jigs and fixtures, that permit speed, accuracy and ease of operation. This is particularly true today with the burden of increased production and the shortage of skilled labor. As a result, study and consideration are given in the design of fixtures so they will incorporate features that avoid unnecessary hand motion and manipulation, assure positive and accurate location of parts and reduce the tool-room hours required for building.

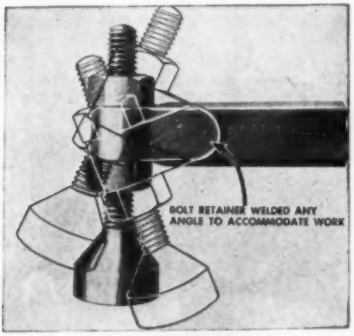

Fig. 1—Ordinary machine bolt is inserted thru bolt retainer. It is then adjusted and locked into position by use of two nuts.

Prior to the inception of the Toggle Clamp, many manufacturers, making their own jigs and fixtures, left the question of clamping and holding of parts in a fixture to the ingenuity of the toolmaker or the shop foreman. Other manufacturers having tool designers or using the services of outside engineering companies depended upon them for modern and efficiently designed tools. Many of these men are conversant with the advantages of the production-built inexpensive Toggle Clamps.

Fig. 2—Four Toggle Clamps hold three connecting rods for precision grinding.

The wide variety of sizes and styles of Toggle Clamps now offered, have made tool designers and production men quick to adopt them, for rapid clamping and releasing of parts in assembly jigs, welding, drilling fixtures and numerous other operations, where quick positive clamp-

*Detroit Stamping Co., Detroit, Mich.

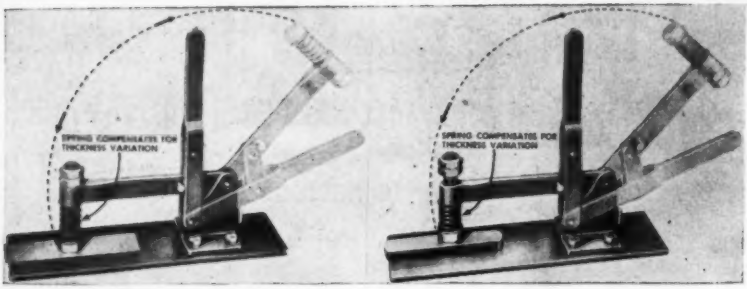

Fig. 3 A, left—Toggle clamp used for quick insertion of steel bushing plate. When clamp is closed, there is no chance for misalignment. It will not open unless opened manually, as shown in Fig. 3 B, right.

ing and instant release contribute to the simplicity and ease of operation. The normal time for opening or closing a Toggle Clamp is less than two seconds. However, the merits of such clamps are by no means restricted alone to the time-saving element.

If an operator should fail to nest a part correctly in a fixture or chips should interfere, the Toggle Clamp will not readily lock into position, thus giving ample warning before the operation can be performed incorrectly. This alone has saved many hours of premium labor in performing subsequent operations on the part before the error was discovered.

There are many operations where it is essential that the same pressure be exerted each time an operation is performed. This is difficult to accomplish with a screw clamp or cam-action clamp. But the toggle clamp exerts a uniform pressure each time it is placed in closed position, once the hold-down spindle has been adjusted and locked.

The wide variation afforded by the use of bolt retainers should also be considered. They can be welded at any angle to the work bar of the clamp; this is determined by the angle at which the clamp is mounted or the contour of the part to be held. An ordinary machine bolt of sufficient length is inserted thru the bolt retainer as shown in the Fig. 1. It is then

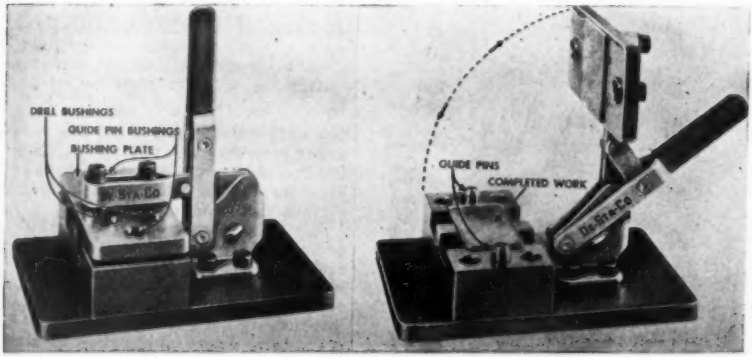

Fig. 4 A, left,—Parts not dimensionally uniform, held by spring assembly and, (Fig. 4-B, right, hold-down spindle of toggle clamp.

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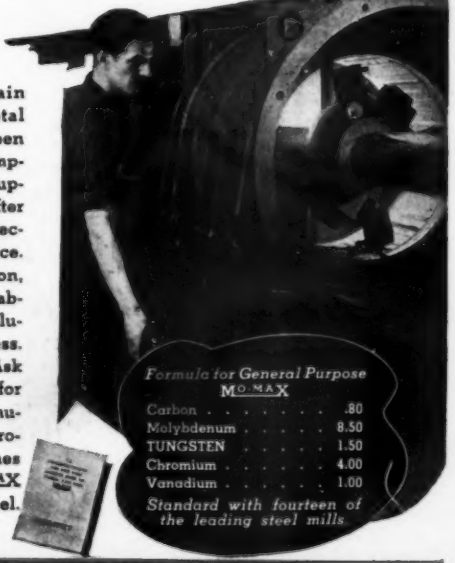

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4814

adjusted and locked into position by the use of two nuts.

If care must be exercised to protect the surface of the part being held, rubber bolt tips are available, thus avoiding the possibility of marring the finish.

One popular application of the clamp is its use in drill jigs, shown in Figures 3A and 3B. Here a toggle clamp was employed to best advantage for quick insertion and removal of parts with the least amount of labor and motion on the part of the operator. You will note there are no latches or lids for the operator to manipulate. Such complications often prove costly and may seriously affect production. Here a steel bushing plate is bolted or otherwise securely fastened to the work bar of the clamp. The bushing plate is drilled to accommodate drill bushings in the proper location. Two hardened dowels are inserted in the lower half of the jig, one on either side, to act as guides. Hence, when the clamp is closed, there is no chance for misalignment, nor will the clamp work loose and open unless it is opened manually, a further safeguard which eliminates rejects and contributes to the safety of the operator. Many modifications of the same application can be made for accurately drilling, tapping, reaming, counter boring, round, hexagon, flat or formed pieces.

Grinding fixtures can be simplified and at the same time made to accommodate the work rapidly and maintain the accuracy required for such operations. Fig. 2 shows four Toggle Clamps holding three connecting rods for precision grinding. Here the expense of a much more costly fixture was saved by the use of heavy duty Toggle Clamps. The work is located and locked in position rapidly, ground and released with a minimum of effort. These and similar fixtures are being used by the builders of aircraft and combat unit engines.

In the design of a jig or fixture for holding castings, forgings, wood components and parts not dimensionally uniform, a problem is usually presented to accommodate the variation. By the use of a simple spring assembly and hold-down spindle of a Toggle Clamp, this problem

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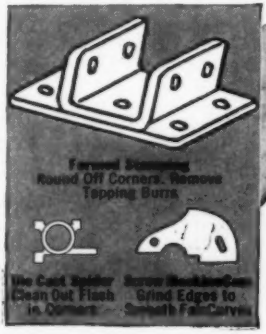

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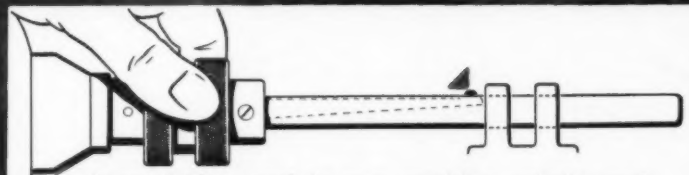
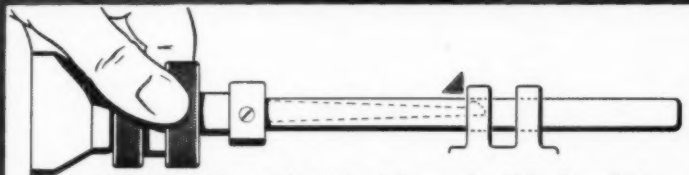
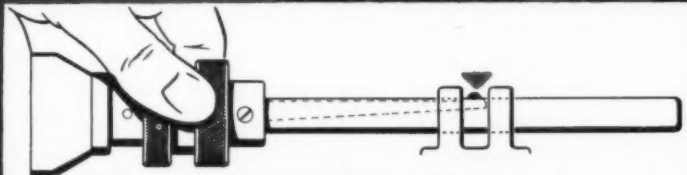


1. Insert Nobur tool in any machine spindle and deburr outside surface of work.

Works like a drill—operator works with complete safety—parts can be burred as fast as they can be handled by operator.



2. After outside surface is deburred, slide knurled sleeve back to retract blade.



3. Move work on over retracted blade and deburr inside surface.

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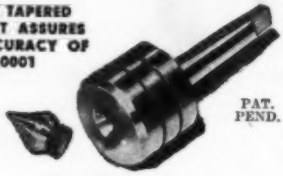

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is overcome, as shown in figures 4A and 4B. A die spring of proper tension is selected, an ordinary machine bolt is inserted thru the spring and the bolt retainer of the clamp. Proper tension is drawn by means of a nut, then locked into position with a second nut. This provides a positive uniform grip.

A few of the numerous applications to which Toggle Clamps lend themselves readily are given here. There are many others, the full extent of their adaptability entering into almost every industry. The Detroit Stamping Co., have available upon request a bulletin with photographs showing designs of fixtures using Toggle Clamps, also half and full scale template kits for draftsmen and designers for use in the design of jigs and fixtures.

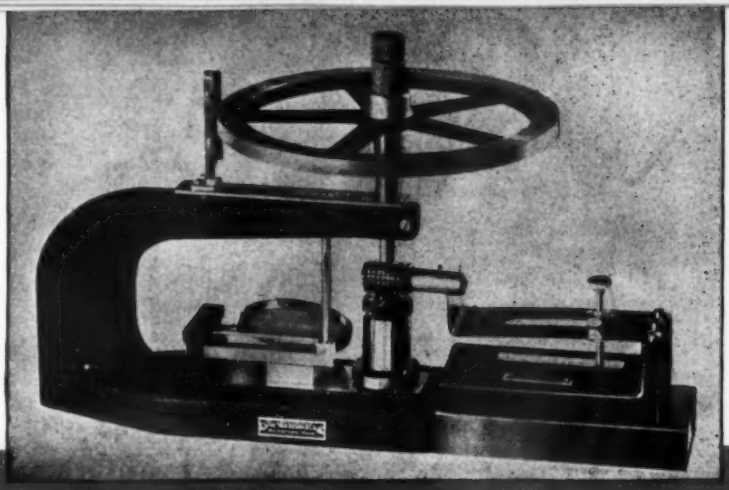
SCREW MACHINE MANUAL

The manpower crisis with its shortage of critical skills appears to most war industries as the outstanding production difficulty. It has had serious effect on production of screw machine products.

The National Screw Machine Products Ass'n., 13212 Shaker Sq., Cleveland, 20, Ohio, recognized the situation and, knowing that Class "A" screw machine operators ordinarily could not be trained in less than two years, or set-up men in less than four years, considered all types of training in use a year ago. They decided none of the existent methods were entirely satisfactory and proceded to map out a supplemental training program.

The result is a Training Manual—"On-the-Job Instruction of Screw Machine Personnel"—presenting easily-understood instructional material and covering all types of multiple spindle automatics, as well as cross-indexing the Brown & Sharpe 14-booklet series to their suggested training method. In addition to functional machine operation, the Manual includes extensive data on grinding and setting tools and comprehensive Trouble Charts. This helpful 107 page manual is sold at $2.00 per copy.

Instruction on-the-job and at the machine is broken down into step-by-step procedures for each fundamental in setting up and operating. In this manner cams, gears, stock loading, etc., are separated, making it possible, if desired, to specialize and instruct in partial setting up and operating, thereby releasing the few highly-skilled remaining operators and set-up men for more intricate matters such as tool setting and adjustment.



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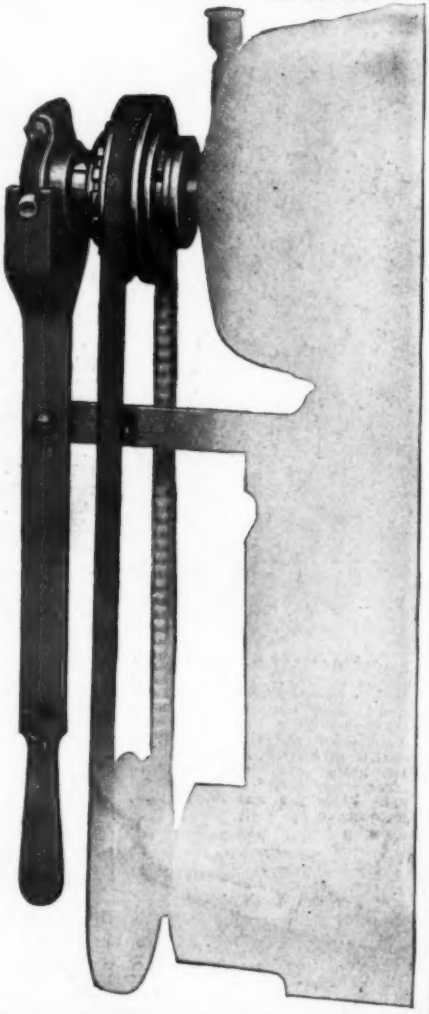

THE FOREMANSHIP FORUM

By Edmund Mottershead

PART XVI — SABOTEURS, INC., NOT FOR PROFIT

WE have heard talk of saboteurs, of Fifth Column, Sixth Column, the Home Front, and other dangers to our war effort. The Nazi saboteurs who landed on the East coast from a submarine aroused nationwide attention. But three malign influences are making daily inroads on production. These escape the focal point of our attention:—the common cold, occupational disease, and fatigue. These three are linked together in many ways. A cold makes fatigue appear more quickly in the worker; a cold makes the worker more susceptible to an occupational disease; an occupational disease makes the worker more susceptible to a cold or to fatigue, and so on. Like the famous "Four Horsemen", these three saboteurs cooperate with each other and complement each other to take an increasingly heavy toll of man hours away from work, as well as an immeasurable reduction of efficiency on the job.

Roger Babson recently stated:—"While Washington experts are doing all in their power to help industry and labor reduce lost man hours caused by accidents and carelessness, the fact remains that the common cold causes more lost production time than any other single cause."

Increased use of new materials, substitute materials, new processes in production, increase in third shifts, additional strains on personnel organizations and on preventive equipment have all contributed to an increase of occupational disease.

The fatigue resulting from longer hours of work under greater pressure, and added strains of worry and uncertainty, especially on part of workers who have friends or relatives serving in the armed forces, has increased more and more as time passes. Normal holidays such as Labor Day, Thanksgiving and others are bypassed. Vacations are forgotten. Men are working six days instead of five, seven days instead of six, and the human frame can stand only so much of this kind of grind without rest, vacation or relief.

Combined, and helping one another to cut into manpower and efficiency, colds, occupational diseases, and fatigue are difficult to separate and say that such and such a percentage is due to fatigue, and so much to illness, etc. But for purposes of discussion we can separate them, analyse their operation on the home and industrial front, and determine to some extent, methods to combat their pernicious influence.

Dr. Morris Fishbein, editor of the Journal of the American Medical Association says that nobody knows how to prevent colds, and that this includes doctors as well as laymen. He says that all we do know is that colds are contagious and spread from one person to another. Since colds do not often make people sick enough to stay away from work, most of us sooner or later contact somebody with a cold and manage to "catch" it ourselves.

Face masks for workers with colds are hardly practical in most industrial jobs. Doctors are not convinced of the value of vaccines. Use of sprays to kill bacteria present in the air, due to coughing and

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sneezing, has been experimented with; ultra violet rays to sterilize air have been tried; but cost of installing much of the necessary apparatus has prevented widespread factory use, and will probably continue to do so. Isolation, which is the ideal method of preventing contagion, with proper ventilation and spacing between workers is probably out for the duration of the war. Vitamins in capsule form often may help people to build up resistance, but their indiscriminate use without medical advice is of uncertain value. The so-called cold shots work in some cases and not in others. Most doctors say the best way to reduce danger of a cold is to get sufficient rest, have plenty of proper nourishing food, avoid exposure both to infected persons and to chills, wet feet, and other discomforts. The secret of avoiding colds seems to be to keep yourself in the best physical condition possible, which is a rather vague remedy. Most people seem to average two or three colds a winter. Some people seem never to have them. Extreme cases are familiar to all of us in persons who seem to get another cold before the previous one disappears.

Dr. Russell L. Cecil estimates that during the winter months, at least 15 % of our entire population in the central and northern zones of winter climate are afflicted with colds at the same time—all winter long. This 15% of the population suffering from colds does not mean 15% absenteeism or 15% reduction in production. However, adding those who are forced to stay in bed to those who lag and are careless and less efficient on the job because of colds, results in a staggering loss to production. It was estimated a few years ago in Boston that the economic loss per employee due to colds, without including the cost of medical attention, was $21.00 a year. One firm reported six days absence per employee for six months of the winter season. Francis P. Garvin, president of the Chemical Foundation, estimated that the average individual loses 10 working days out of the year because of disability from common colds.

Quoting Dr. Cecil:—"This loss amounts to more than a million years of activity annually. The loss to all business activi-

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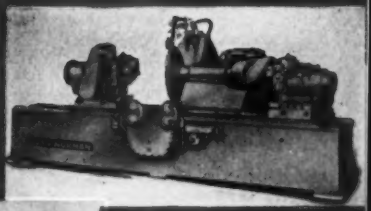

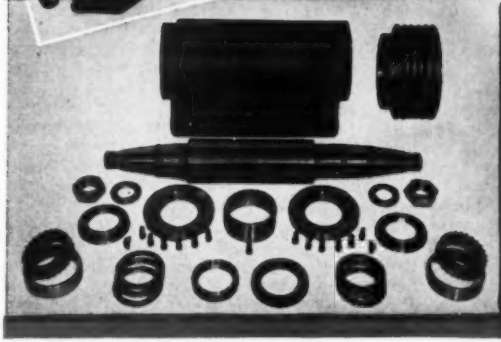

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ties is some 700,000 years of working time thru the incapacitation of 15 million workers in this country. It is claimed that 90% of infant mortality in the U. S. is directly traceable to the common cold. Certainly most physicians would admit that 60 to 80% of their practice is attributable to the ravages of common colds.

"We have all come to think of a cold as being closely related to conditions of winter, and it is true that colds are more common in winter than in summer. However, cold weather alone is not enough to induce a common cold. At the present time, most authorities are pretty well agreed that the common cold is a virus-borne disease.

"Focal infection has long been known to play an important role in the causation of colds. Infected tonsils, infected sinuses, chronic bronchitis, all tend to keep the mucous membrane irritated. Furthermore, virulent germs are harbored which at the slightest provocation stir up fresh infection in the whole respiratory tract.

"The constitution is an important factor, and by that I mean what we now refer to frequently as the allergic constitution, the individual who is susceptible to hay fever, asthma, etc. These people have a particularly sensitive mucous membrane which is readily irritated, and becomes ready prey for invasion of bacteria. It seems quite likely that some people become allergic to bacteria also.

"Next there is the well known factor of chilling, and this is a factor which is too often neglected in industry. In many offices and factories, some members of the staff are exposed to almost constant chilling from open doors, windows, or air shafts, and I believe it accounts for a great deal of sickness and incapacity.

"Wet clothing is another factor, particularly wet feet, and we stress the feet because it is so easy to get the feet wet as one walks around the city on a rainy day. Incidentally, it seems to be unequal wetting and chilling of the body that causes the trouble.

"A high percentage of common colds are complicated by sinus infection. Indeed, any cold that lasts more than five or six days should make one suspicious

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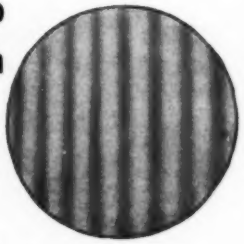

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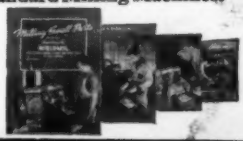

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of sinus involvement. Perhaps most important of all is pneumonia. It is estimated that fully 90% of pneumonias come on after a common cold or an attack of grippe. It is quite difficult for the pneumonia germ to get a foothold unless the soil has been prepared by the cold virus. People do not die of common colds, or of influenza either, but a great many die from pneumonia, and this in spite of the wonderful new treatment we have for this disease. Most of these pneumonia deaths could have been prevented if we could only have prevented the common colds which preceded them."

There is another aspect of the common cold problem, not often appreciated, which links it closely to occupational diseases. That is the frequency with which common colds are followed by recurrences or flare-ups of some old and chronic diseases. There are many illustrations. The person who has returned home from a tuberculosis sanitarium, apparently cured, is taken ill with a cold. The cold passes away, but the fever and cough remain. Examination shows that the old tuberculosis trouble is active again. Chronic arthritis, rheumatism, heart disease, nephritis, diabetes, and many others work the same way. This tendency of common colds to stir up old systemic disorders is one of the most serious aspects of the situation, and is reflected equally in the incidence of occupational diseases.

Dr. Cecil has also stated that:—"any form of prophylaxis which will be practical for the masses (or for large scale industrial use) will have to be exceedingly simple in its application. We have no such method available at the present time." For the industrial manager or foreman who seriously wants to reduce his accident, absentee, and illness incidence, prevention of the common cold is a serious problem, and can be met only thru consideration of fatigue factors in the plant, of occupational disease factors, morale, and such individual attention to the workers on a social work basis as proves practicable.

Occupational diseases, as far as medical treatment is concerned, are beyond the scope of the average foreman, as is

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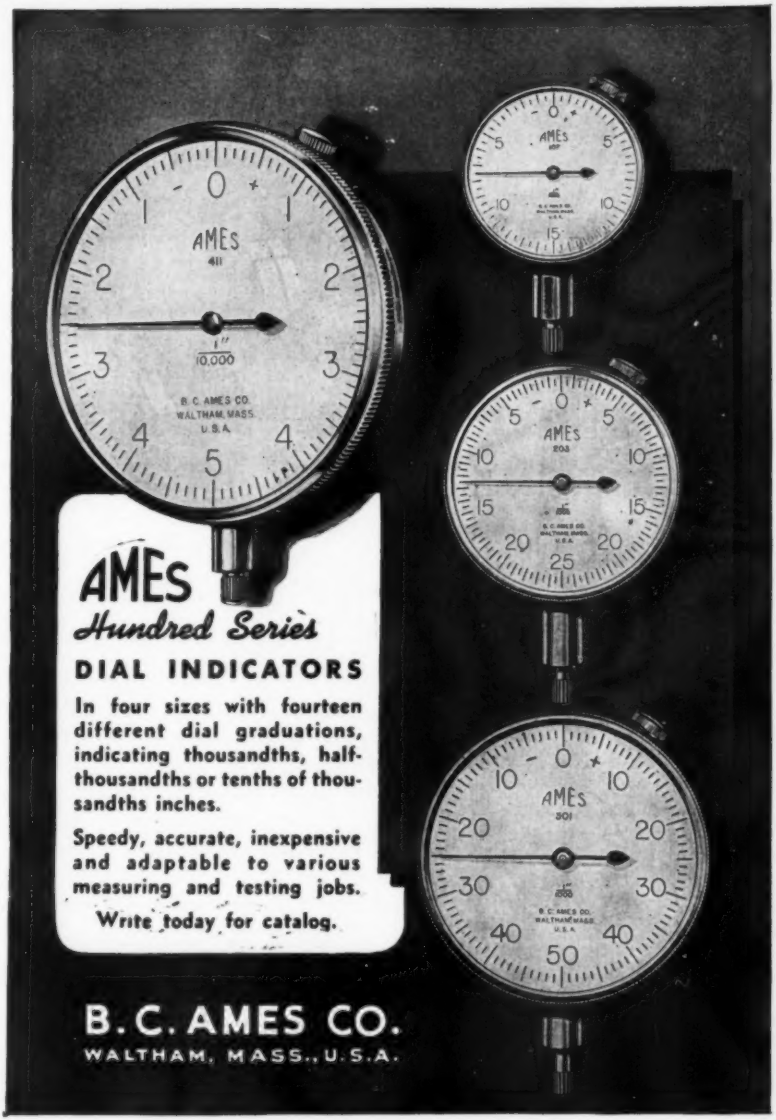
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the nature of the work itself which leads to the occurrence of the disease. However, a supervisor must be on the alert for recurring cases, and in the event of any apparently chronic condition in an individual worker, must require that the worker obtain a competent physician's examination and treatment. Not only is this a responsibility of the foreman, but he must also be alert to the physical conditions in the plant and the job which affect the health of workers.

These factors are commonly grouped under five headings, and include heating and ventilation, lighting and vision, dust-fumes-vapors-gases-mists, personal hygiene facilities, and personal protection.

Inadequate ventilation predisposes the worker to disease and reduces the energy and physical capacity of the worker. For ordinary conditions, six changes of air per hour will suffice, but in many plants where the addition of second and third shifts puts unusual strain on the ventilating equipment, additional changes or at least additional attention to the ventilating equipment may be necessary. A temperature of 70 degrees with a humidity of 50 percent is about right for ordinary factory tasks. In high temperatures, especially during the summer or on jobs where furnaces or heat treating equipment is used, the use of salt tablets has been found effective in preventing heat prostration.

Without proper lighting, eye damage may occur, spoilage of material will increase, and production will suffer. Every effort should be made to obtain the best possible light for the workers. The important thing for foremen to consider in this connection is the fact that lighting systems in most industrial establishments were designed primarily to aid natural light on a gloomy day, or at the most, to light up the plant early in the morning or late in the afternoon when sunlight was not available. There is no question that workers perform better in sunlight rather than in artificial light. The nearer the approach to sunlight provided by the plant lighting system, the better it is for the workers. In some extreme cases, plant lighting systems should be modified to provide 20 to 30 times as much light as they do now. Lighting engineers working in industry have estimated conservatively that on the average, the lighting facilities should be increased six or eight-fold in most plants to provide adequate light for third shift workers.

The most satisfactory way of controlling dust, fumes, mists, vapors, and gases, is to capture them at point of origin by use of local exhaust systems designed to fit the particular situations. The atmosphere in manholes, gas handling or processing equipment, sewers, furnaces, etc., should be tested carefully for presence of toxic, noxious, or poisonous gases before permitting men to work in or around those spots. Small portable test kits are available for this purpose, and should be part of standard equipment in the plant. In cases of emergency or when men are for any reason required to enter a gaseous atmosphere, they should be protected with oxygen supplying masks, a life belt and a line, and helper who remains in the clear to observe the work and safeguard the man who is in the danger zone. Resuscitating equipment and trained operators should be readily available, and some permanent employee of the plant

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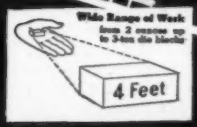

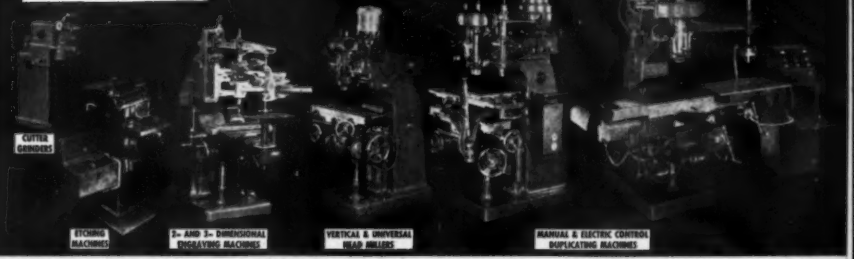
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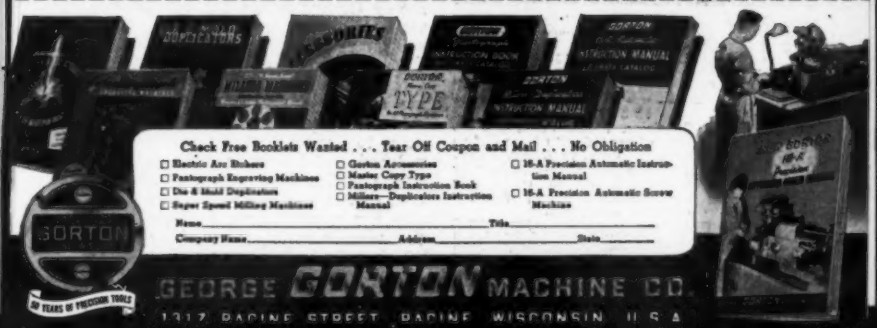

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Far too often, various dusts, fumes, and gases occur in production in such a way that it is extremely inconvenient and sometimes impossible to control them by capture at source, and the operator is forced to wear continually, some protective device as a gas mask. Unfortunately these masks and similar equipment are seldom styled for comfort. They are hot, heavy, uncomfortable in fit, and the worker tends to take chances on the presence of the dangerous fumes rather than bear the discomfort of the safety apparatus. It is up to the foreman or supervisor on the job to see first, that workers consistently use these safety masks. Secondly, to be alert for any change of process or reengineering of the work itself to eliminate the difficulty and provide for capture of the gas and exhausting it without necessitating the wearing of a mask. It may also be that he could find ways of improving the comfort aspect of wearing the equipment in question.

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Personal hygiene facilities include:—eating places, which should be clean, well lighted and ventilated, and separate from the workshop; drinking facilities, which should provide an angle-jet fountain, cool and wholesome water with no ice in direct contact with the water; dressing and locker room, which should be clean, well lighted and ventilated, and separate from workroom and lunchroom; washing and bathing facilities should include plenty of soap and running water, both hot and cold with clean individual towels of some sort; toilet facilities which again must be clean, well lighted and ventilated, and should be scrubbed daily with hot water and soap and some germicidal substance. In all of these personal hygiene facilities, one of the greatest single aspects of maintaining cleanliness and respect for order and neatness is to provide the facilities dressed up in good order, with good lights, and above all plenty of fresh looking light colored paint. A few dollars' worth of paint in these rooms will do a great deal for morale. Sufficient inexpensive mirrors, reasonably comfortable chairs in the lunchroom, a place to lie down in the dressing room, modern toilet seats and other facilities; in other words, anything which tends to make facilities both modern and homelike will build employee morale while it is doing a job in maintaining employee health and efficiency.

Personal protection, the use of respiratory devices, gloves, goggles, leggings, aprons, hard hats, etc., are important factors in many jobs. The foreman or supervisor should be fully acquainted with requirements of the job and with the American Standard Safety Code for the Protection of Head, Eyes, and Respiratory Organs as an aid to his care of workers. Health and safety, diseases, colds, and fatigue are as we can see, interlinked in their effects. By following safety procedures, occupational diseases are averted or at least of lessened incidence. By controlling occupational disease to some extent, the common cold is reduced, and fatigue is lessened. By doing things which work for less fatigue, the worker is not only more productive, but also has greater powers of resistance to the other hazards, physical or bacterial, which exist in his surroundings.

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In considering the subject of fatigue in this article our purpose is not to exhaust the types, kinds and causes of fatigue. Rather, we are trying to present for consideration of foremen some of the salient factors and a few of the more common situations, together with constructive suggestions. A certain amount of fatigue is a normal result of physical activity of any kind, and as such is harmless. It becomes harmful, however, if carried to the point where complete recuperation does not take place after a reasonable period of rest. Such fatigue not only lowers efficiency of workers, but also slowly undermines their health. It is not sufficiently recognized in industry that harmful over-fatigue may be brought on unnecessarily and that this may be caused by working conditions or by the habits and living conditions of workers, or by a combination of both.

According to the National Safety Council, "Safe Practices Pamphlet No. 50", "the average person thinks af fatigue as merely tired muscles, a condition relieved by rest, food, and sleep. Actually, it is generally the nervous system controlling the muscles that is tired. Fatigue is recognized as being of two kinds:—(1) Ordinary fatigue due to muscular exertion without sufficient rest and relaxation; (2) Nervous fatigue due to exhaustion of the nerve force. This almost always is the result of driving the body beyond its ability to recuperate completely.

"Pathologically, fatigue has been described as an exhausted condition of the muscular and nervous systems not restored by rest or food. This causes the worker to be at a lower level of mental and bodily vigor the following day. If continued, it leads to reduced capacity for work, or permanent disability. Physiologically, it is defined as a more or less complete loss of the ability to react to a stimulus, brought on by functional activities or the result of activities which show themselves in a diminished capacity for doing work."

As a result of many investigations of fatigue from health, time study, and other standpoints, the physician and the employer have much information available to aid in definite fatigue prevention. One symptom of fatigue is slowness to respond to stimulus. A worker who is fatigued does not see, hear, understand, or act with his usual speed. Other symptoms include irritability, indifference, tardiness, absenteeism, etc. The causes of fatigue are varied and numerous, and it is almost always true that in the case of any single worker, there are several causes operative at the same time. However, for purposes of analysis and discussion, and also for purposes of corrective action by management, it is possible to break them down into such a list as is provided by the National Safety Council:

"1—Personal Causes: — Adaptation to the job; Personal Worry; Health.

"2—Home Conditions:—Housing; Poverty; Amusements.

"3—Working Conditions:—Hours of work; Speed; Rhythm; Concentration; Complexity; Noise; Vibration; Heavy weight; Posture; Danger of accident; Health hazards; Monotony; Ventilation; Light; Space; Excessive cold or heat; Food; Sanitary facilities; Transportation; Personnel; Experience; Clothing; Wages; Smells, appearance of workroom, etc.

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Workmen are more rapidly fatigued when they are working at jobs which they dislike or tasks for which they are not fitted. Foreman:—get the right men in the right jobs.

Worry is well recognized as a source of fatigue, causing not only actual distraction from work, but is a drain on the nervous system. As much fatigue is nervous rather than physical, the importance of worry increases as a source of fatigue to the point where it is the duty of foremen and supervisors to be alert to the frame of mind of their workers. They should help to handle these worries, whether pertaining to the job or to the workers' own life.

Illness of other members of the family and worry incidental to that situation is another cause of fatigue. Lucy Ogden Norton, Assistant Supervisor of Personnel at General Electric Co's., plant at Erie, Pa., says their efforts to deal with absenteeism have included a home visiting program. This is designed to assist the employee and his family to adjust to wartime conditions under which the man is working, and to acquaint the man and his family with company benefits and policies. Such a system as a natural by-product would serve to acquaint the company with the worker's home problems to such an extent that in many instances, the company could be of definite assistance in solving the worker's problems. This would help to alleviate much worry and fatigue, helping to overcome the absenteeism and lost production ordinarily found.

The general health of the worker is important. Workmen in impaired physical condition are more prone to fatigue and hence to accidents, mistakes, inaccuracy etc.

A workman whose home is unsanitary, poorly ventilated, dirty, and unattractive is likely to have poor health and also to show signs of unhappiness, dissatisfaction and lack of good morale all around, all of which tends to cause fatigue and lost production. The remedy goes back to the visiting system of GE, and improved housing conditions devised thru whatever aid the company involved, sees fit or is able to provide.

Poverty invites poor health, discontent and fatigue from worries. Often it is due not so much to low wages as to the employee's inability to manage his personal, and especially his financial affairs. It produces a sluggishness of mind and creates a hopeless attitude from which it is difficult to recuperate. Education, thrift campaigns, part of the pay-as-you-go plan modified to fit particular situations, employee salary savings plan, and the home visiting system are parts of the answer.

Some types and cases of undue fatigue may be eliminated by provision of proper recreational facilities and suitable amusement. These factors, if not directed into desirable channels, may be detrimental to the health of the employees. Many workers, neither to their credit nor discredit, if left entirely to their own guidance, overindulge in types of recreation which do not contribute to good health. Drunkenness, late partying and similar activities bring Joe to work late in the morning and tired before he starts, and it takes more than one day and one night's sleep for him to recuperate. It is advisable to have plant recreational activities well organized so that they may gain ready acceptance of workers who do not as yet participate. It is also advisable to have as much of the organization and management of the recreational activities spring voluntarily from the employees and be conducted by them to avoid the paternalism and other occasionally stultifying influences of management upon the spontaneity of such things.

Working conditions, as indicated in the outline provided by the National Safety Council, include many variable causes of unnecessary fatigue. Long daily and weekly hours not only produce fatigue,

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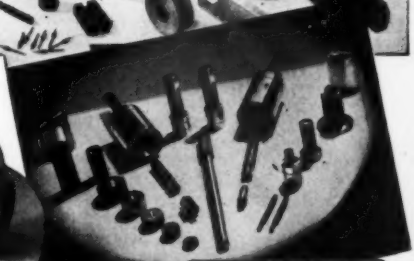

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but tend to prevent sufficient time for recuperation. High speed machinery tends to create fatigue, due to vibration, noise, increased speed for the operator, and accompanying nervous strains. Tensions, rhythms and monotony add to the problem. Rest periods at regular intervals are a partial solution. The best technique for the rest period, is complete relaxation which often must be taught to the workers. Second best is uncontrolled rest where the worker is allowed to choose his own method of rest for the period. And lagging far behind in terms of real relaxation and results are music, refreshments of one kind or another, walks, games, etc. The National Safety Council says:

"Authorized rest periods ordinarily do not add to the unauthorized amount of time taken by the workers for resting. Investigation has shown that workers in almost all occupations voluntarily take rest periods ranging from three minutes an hour in light work to 12 minutes an hour on heavier work. In unauthorized rest periods, however, there is usually a slight strain or tension caused by fear of being caught in the act, whereas in a rest period sanctioned by management, the worker is able to relax completely ang get full benefit from the rest period.

"The introduction of recesses or rest periods within two hours after starting a plant for the day has, in some instances, almost eliminated tardiness and eating at work during the morning. Many workers report to their occupations without eating breakfast, depending upon a chance to eat a sandwich shortly after arriving at the factory. Authorized rest periods diminish the loss of time resulting from such unregulated causes. In the case of girl workers, rest periods reduce the number of times they may go to rest rooms, and tend to prevent loafing on the job.

"The primary purpose of rest periods is to raise the efficiency of workers by reducing temporary fatigue, preventing cumulative fatigue, and in turn, reducing number of accidents resulting from fatigue. Investigations have proved the rest period should be introduced at about the time production reaches its maximum. Length of the rest periods depends upon the type of work being performed."

Speed, rhythm, lighting space, ventilation, and other factors as listed, contribute to fatigue of the worker. The essential thing for foremen to bear in mind is that fatigue itself reduces production directly, and further reduces production by increasing the accident rate, spoilage, scrap and rework rates, absenteeism and tardiness. Fatigue may also underly the poor health and lack of resistance workers display to the common cold and to occupational diseases. When fatigue has taken hold of the personnel in a plant, it is not long before occupational diseases and hazards are making themselves felt strongly, and it is but a short step from a run-down-condition to an attack of the grippe, influenza, pneumonia, or a recurrence of some other chronic trouble.

The foreman's responsibility in this matter is twofold:

1—His personal interest in the employees should extend sufficiently into their private lives and their personal physical and mental conditions to give them whatever help he can, or to see to it that the agencies in the plant, provided for such purposes, take action in the particular case.

2—To be alert to the physical and mechanical conditions of his department, and of the entire plant for that matter, so that hazards leading toward occupational disease are safeguarded against, and fatigue is reduced to a minimum. Thus many of the well-known conditions making the common cold common are eliminated.

The foreman as a manager is entrusted with materials, equipment, plant facilities, and manpower—by no means the least important of which is manpower. As supervisor, it is his function to see that the manpower entrusted to him is kept at the optimum level of productivity. And as a teacher, his function is to help educate that manpower along lines which will build strength, health, and efficiency.

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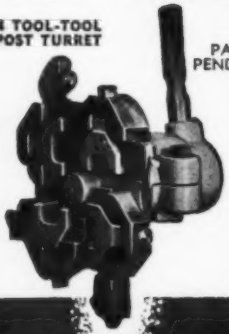

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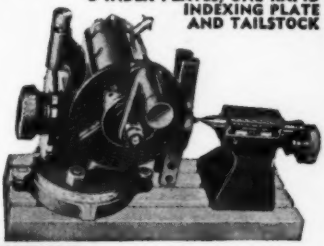

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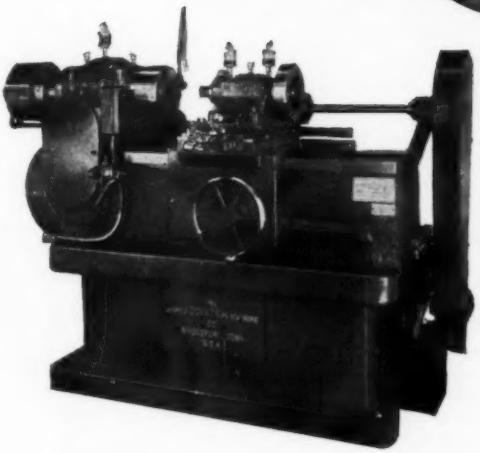

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Consider All Factors In Calculating Welding Costs

By W. J. CONLEY*

ENGINEERING methods and control are being adopted in more and more welding shops so that considerably more interest is being shown in cost control. This article is written for the guidance of production officials who are in charge of arc welding applications and responsible for cost control.

The data is based on the type of electrode designated as E 6010 according to standards of the American Welding Society. This electrode tends to produce a flat bead designated as type A. Other different types shown in Fig. 1 are designated as types B and C.

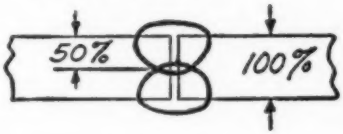

FIG. 1

The tables I, II and III refer to the electrode, E 6010 used in the welding of joints consisting of straight butt welds, flat positioned, two passes. Details of the joint are shown in the sketch (Fig. 2) with corresponding welding data in Table I.

It must be kept in mind that the data given applies to types of work having good fit-up.

CALCULATIONS OF COSTS

Total Production Cost:—Table II gives costs in cents for various floor-to-floor speeds and plate thicknesses.

Floor-To-Floor Speed:—This term designates the rate of production including actual arc time, plus handling time, plus time out for changing electrode, (and so forth). In other words, it is the arc speed multiplied by the operating factor. This quantity varies for different shops. A wide range of speeds is given so as to fit the condition of highly efficient shops as well as those with inefficient set ups for welding.

Total production cost is derived by calculating and adding:— (1) Power cost. (2) Electrode cost. (3) Labor cost per foot of joint. This is the procedure:

(A in Table II)—Data—The data for this particular type of joint are obtained from table I and arranged in tabular form as shown with each column given a reference number. Column 6 (per cent efficiency) is obtained from Table III.

Arc speed in feet of bead per hour (Column 7) is not given in every case for the procedures and speeds of various joints. This has been derived for certain joints by interpolating from the arc speed

*Consulting Engineer, The Lincoln Electric Co., Cleveland, Ohio.

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TABLE I

Joint Fig. 1	Beads or Passes	Electrode Size	Current Amps	Min. Arc Volts	*Arc Speed, Ft. of Joint Per Hr.	Lbs. of Electrode Per Foot of Weld
3/16" plate	2	1/4"	190	30	45	.16
1/4" plate	2	5/16"	300	34	45	.27
3/8" plate	2	5/16"	450	38	40	.45
1/2" plate	2	3/8"	550	40	28	.92

*NOTE:- Speeds are for actual arc time only and do not take into account other factors. The speeds given are results of many actual tests and are, therefore, true average arc speeds. The speeds are for actual arc time only with no allowance for fatigue, cleaning, setting up, etc., as these items vary greatly in different shops. These factors must be taken into account in obtaining the production speed.

in feet of joint per hour. It often varies for different passes even tho the same size electrode is used depending upon whether or not weaving is employed. This arc speed for each bead affects the total power cost.

(B in Table II)—Calculation of Power and Electrode Costs:—These calculations are based on the data given in Table II (A). Take for example, calculation of costs for a ⅜" plate.

Arc Kilowatts:—This item as shown in Column 10 is derived by multiplying the welding amperes (Column 4) by the arc voltage (Column 5) and dividing by 1000. In other words, 425 times 38 divided by 1000 equals 16.15.

Input Kilowatts:—The power input of the welding machine is equal to the power output (arc kilowatts) divided by the welder efficiency at arc voltage. In other words, 16.15 divided by .59 equals 27.4 as shown in Column 11.

Power Cost Per Hour:—This item as shown in Column 12 is the power input multiplied by the prevailing rate for kilowatt hours. In all of these calculations, the rate of 2 cents per kilowatt hour is assumed. For the example given, this cost would therefore be 27.4 times 2 equals 54.8 cents per hour.

Power Cost Per Foot:—This item in column 13 is derived by dividing the power cost per hour by the arc speed per hour. Inasmuch as this factor varies for different beads in the weld, it is calculated on the basis of cost per bead, then totaled to get the cost per foot of weld. In order to save space in the printing of these tables, the data for a series of beads where the various quantities are the same are not repeated but are included in one line designated for the entire series of passes. The total power cost per foot of joint is separated from the power costs of an individual pass of a series of passes by a line as shown in this example. Deriving the power cost for this particular plate thickness we have:—54.8 divided by 80 equals approximately .69 cents per foot of bead. Then the total power cost per foot of joint is .69 times 2 (passes) which equals 1.38 cents per foot of joint.

Electrode Cost Per Foot:—This item in Column 14 is derived by multiplying the electrode pounds per foot by the prevailing cost of electrodes per pound. In these calculations, it is assumed that the cost of electrodes is 6½ cents, which is a conservative figure. However, this price varies with the shipping zone and the

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TABLE II — CALCULATION OF WELDING PRODUCTION COSTS
Type of Joint (See Fig. 1 and Table I): Square Groove Butt Welds — Flat Position — Two Passes — With "Type A" Electrodes
TOTAL PRODUCTION COST PER FOOT OF JOINT (Cents):

Floor-to-Floor Speed — Ft./Hr.		35	30	25	22.5	20	17.5	15	12.5	10	7.5	5
TOTAL COST --Cents for Various Plates	3/16"	4.36	4.83	5.50	5.94	6.50	7.22	8.17	9.50	11.50	14.82	....
	1/4"	5.40	5.87	6.54	6.98	7.54	8.26	9.21	10.54	12.54	15.86	.....
	3/8"	....	7.63	8.30	8.74	9.30	10.02	10.97	12.30	14.30	17.62	24.3(
	1/2"	....	....	....	....	13.42	14.14	15.09	16.42	18.42	21.74	28.4

DERIVED AS FOLLOWS:

(A) DATA (From tables of procedures and speeds — Table I):

1 Plate Thickness	2 Pass Number	3 Size Electrode	4 Welding Amperes	5 Arc Voltage	6 Per Cent Efficiency At arc voltage	7 Arc Speed Ft. of bead/hr.	8 Arc Speed Ft. of joint/hr.	9 Electrode Consumed Lbs./Ft. Joint
3/16"	1-2	1/4"	190	30	53.5	90	45	.16
1/4"	1-2	5/16"	300	34	58	90	45	.27
3/8"	1-2	5/16"	425	38	59	80	40	.45
1/2"	1-2	3/8"	500	40	60	55	28	.92

(B) CALCULATION OF POWER AND ELECTRODE COSTS (Cents):

Plate	Pass	10 Arc Kilowatts (Col. 4 x Col. 5 ÷ 1000)	11 Input Kilowatts (Col. 10 ÷ Col. 6)	12 Power Cost/Hr. (Col. 11 x 2c)	13 Power Cost/Ft. of Bead (Col. 12 ÷ Col. 7) and Per Ft. of Joint	14 Electrode Cost/Ft. of Joint (Col. 9 x 6-1/2c)	15 Power + Electrode Cost/Ft. of Joint (Col. 13 + Col. 14)
3/16"	1-2	5.7	10.65	21.3	.238 / .456	1.04	1.50
1/4"	1-2	10.2	17.6	35.2	.394 / .788	1.75	2.54
3/8"	1-2	16.15	27.4	54.8	.69 / 1.38	2.92	4.30
1/2"	1-2	20.0	33.3	66.6	1.21 / 2.42	5.98	8.42

(C) CALCULATION OF LABOR COST (Cents):

Floor-to-Floor Speed — Ft. Hr.	35	30	25	22.5	20	17.5	15	12.5	10	7.5	5
LABOR COST ¢/Ft. of Joint	2.86	3.33	4.0	4.44	5.0	5.72	6.67	8.0	10.0	13.32	20.

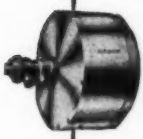

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TABLE III — EFFICIENCY OF GENERATOR — PER CENT

Operating Amperage	RATING OF GENERATOR					
	100 Amps.	150 Amps.	200 Amps.	300 Amps.	400 Amps.	600 Amps.
50	50	51	55			
100	52	58	60	58		
150		57	60	61	61	60
200		52	59	62	62	62
300			53	61	64	65
400				56	63	66
600					58	65
800						60

quantity purchased. For the example being discussed, the electrode cost is .45 times 6½ which equals 2.92 cents per foot of joint.

Power Plus Electrode Cost:—The sum of the power and electrode costs for this particular joint would be 1.38 plus 2.92 equals 4.30 cents per foot of joint.

(C in Table II)—Calculation of Labor Cost:—In these calculations, the cost of labor is assumed to be $1.00 per hour (excluding overhead). Labor cost per foot of joint is derived by dividing the labor rate by the production (floor-to-floor) speed. In other words assuming a floor-to-floor speed of 20 feet per hour, the labor cost per foot would be $1.00 divided by 20 equals 5 cents per foot of joint.

To change the information given in these tables when the labor rate is other than $1.00 per hour, it is simply necessary to multiply the labor cost per foot given in the table by the prevailing rate in cents and divide this by 100. For example, if the rate is $1.25 per hour, the labor cost for ⅜" plate at a floor-to-floor speed of 20 feet per hour would be:—5.0 times 125 divided by 100, equals 5.0 times 1.25 equals 6.25 cents per foot of joint.

Total Production Cost: — As already

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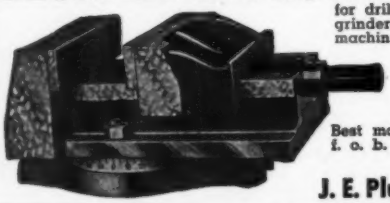

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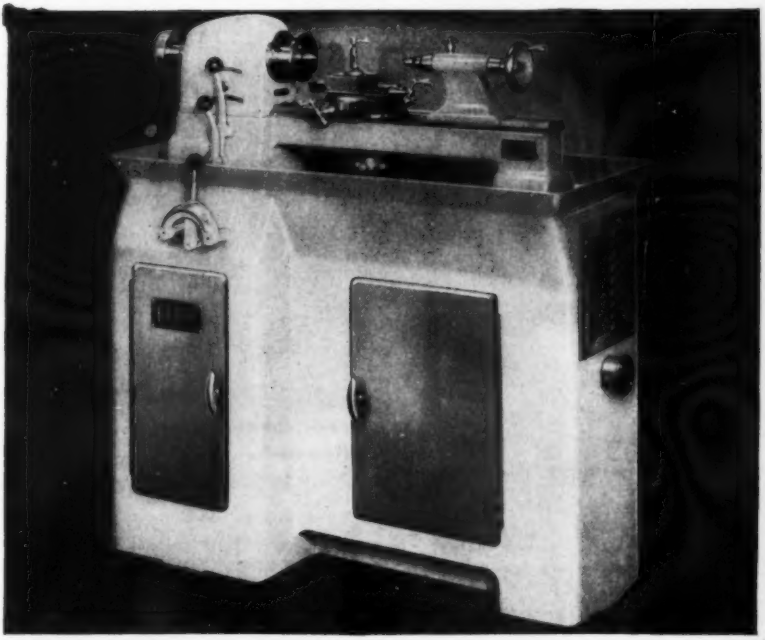

Precision

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ELGIN TOOL WORKS

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Better Hardening – Better Results

We can make your tools do more work, and last longer, too. We have U. S. Army and U. S. Navy Aircraft Approval for heat treating, obtained after rigid tests and careful check-up by Army and Navy personnel.

Perfection's skilful work is helping manufacturers in 31 states . . . 26 years specializing in treating tools, dies, molds, and "fussy" mechanical parts. We treat tons of tools—in wide variety. Many require the use of 5 or 6 furnaces to get just the right result. When ordinary methods do not suffice, we have new ones like these:

DEEPFREEZING—The ideal way to quick-age parts, stabilize gauges, and get rid of retained austenite.

NUSITE—Produces higher hardness (65 to 67 Rockwell C) throughout high speed cutting tools—and still they are almost twice as tough.

SILVER FINISH—Bright hardening . . up to 1900 dg. F. No scale or discoloration. Polished pieces retain their shine. Saves grinding. Fine for engraved dies, threaded parts, die casting, and inserts.

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stated, the total production cost is power cost plus electrode cost plus labor cost. In other words, for the ⅜" plate discussed, at a floor-to-floor speed of 20 feet per hour, the total cost is 4.30 (Column 15) plus 5.0 (labor) equals 9.3 cents per foot of joint as shown in Table II and summarized in this manner:

For straight butt welds (square groove) on ⅜" plate with good fit-up—

Floor-to-floor speed = 20 feet per hour—

Total cost without labor (from B in Table II, column 15)	4.30 cents
Total cost of labor (from C in Table II)	5.00 cents
Total costs	9.30 cents

Rapid Method of Estimating Cost:—There are relations and ratios between electrode consumed or required and power. Use may be made of these facts in developing a rapid method of cost estimating. This will be found rather accurate and very rapid:

Divide the labor cost in cents by the floor-to-floor production speed. This will give the labor cost in cents per foot. To this, add 9.5 times the pounds of electrode required per foot. The sum will be the cost per foot of joint in cents.

As an example:

Labor is 100 cents per hour. Production speed is 12.5 feet per hour. Hence, labor cost is 8 cents per foot.

Assume a 3/16" square groove joint (Fig. 1). It takes .16 pounds electrode per foot. Therefore:—.16 x 9.5 = 1.52, then 8 + 1.52 = 9.52 cents—total cost per foot of joint. This is checked by reference to Table II where cost is given as 9.50 cents.

This is based on 6½ cents per pound for electrode and 2 cents per kilowatt hour for power.

For rates other than these, the constant 9.5 must be changed accordingly, e.g., for electrode at 8½ cents per pound, the 9.5 constant becomes 11.5.

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You Are Just Making
A Sound Investment When
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For War or Peace

A DEPENDABLE MILLING MACHINE

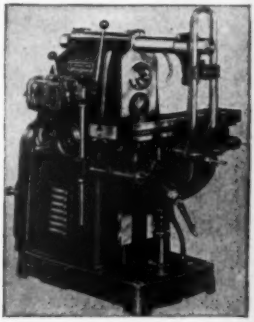
Simmons No. 1A Micro-Miller, Drawn by Lili Rethi

★ SIMMONS HAS PRODUCED a machine particularly adapted to the requirements of the manufacturing and jobbing shop for the milling of miscellaneous parts. The No. 1A Micro-Miller is *low in cost, sturdy and simple to operate.*

Because of the ease of operation and close grouping of all controls, it is equally efficient on production runs as well as limited quantities requiring frequent set-ups. All control levers are grouped on left within immediate reach of operator.

Within the one-piece column and base is the patented Simmons *Micro-Speed Drive* unit, providing an infinite number of spindle-speeds throughout two speed ranges. Correct speed is immediately available by turning the Selector Dial while the spindle is in operation.

Investigate the merits of this compact miller by writing today for complete details. Simmons Machine Tool Corporation, 1725 North Broadway, Albany 1, N. Y.



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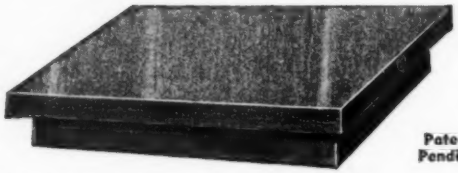

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18″ x 24″	160 lbs.	24″ x 36″	480 lbs.

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EXTERNAL
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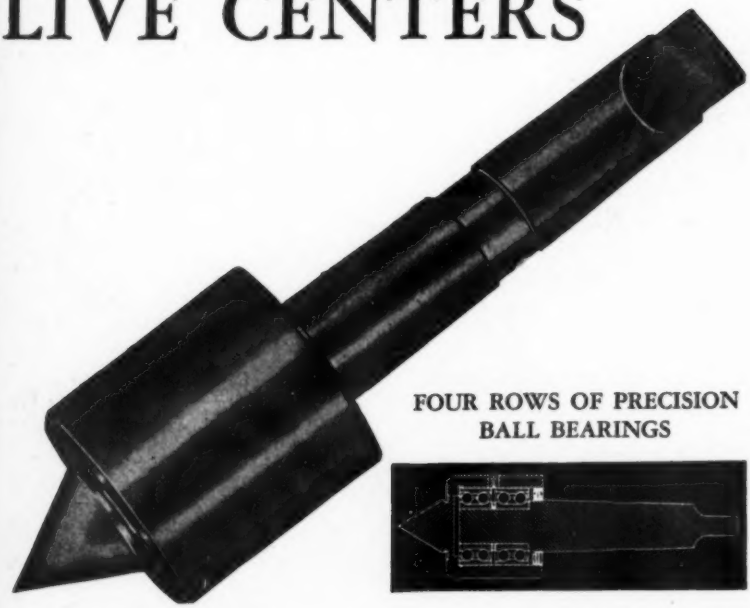

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Diamond Powder As a Lapping Compound

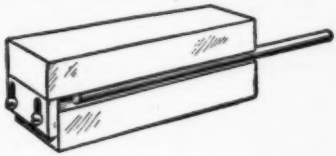
By R. H. TAYLOR, Research Engineer

WHENEVER the use of diamond powder for grinding small holes and surfaces, requiring fine and accurate finish, is suggested, many shop executives are inclined to consider it too expensive for the machine shop and, hence, impractical. While it is true that, in the past, some shops have experimented with diamond powder and discarded its use, investigations as to the reasons for this have led to the conclusion that their difficulties were caused by not properly preparing their laps; use of an improper grade of diamond powder and, in many instances, too slow a lapping speed.

Steel Roller for rolling diamond fragments

In compliance with frequent requests, helpful information regarding the proper charging of laps for general and special types of work, is given:

Charging of laps is a simple procedure, consisting of a method by means of which the abrasive particles are embedded into the surface of the lap and then rolled in a direction that will bind the particles to the surface of the lap and holding them in position against operational friction.



Charging Blocks for small pin laps

Admittedly, the hardness and structure of diamond particles enable them to withstand all the pressure that may be placed on the body of the lap, and the problem confronting prospective users, is how to get the particles in place to do the work, and the proper grain size for cutting and subsequent finishing.

Laps are made of various materials, but soft steel, iron and bronze are generally used for the lapping of hard steels and cemented carbides. For softer materials and high finishes on these metals, laps of lead, boxwood or ivory, are frequently applied, and their efficiency depends on suitable grain size of the powder, together with the proper speed.

Surface lapping is done with a flat lap, run vertically and horizontally, while laps for grinding small holes are made round and of a diameter that will provide clearance when grinding the hole. When pin laps are to be inserted into a transverse spindle grinder, they should be made to run true. For a hole diameter of approx. 1 mm, the speed that will give best results should be approx. 45000 rpm. Care

MANPOWER?

"De-skilling" the jobs is one effective answer to the manpower shortage. Simplifying equipment or operations enables you to use less expert help and at the same time keep up production.

On grinding jobs using magnetic chucks, Neu-T-Rol removes a formidable production bottleneck—releasing work promptly from the magnetic chucks and demagnetizing as it releases. With Neu-T-Rol you don't need a husky operator to hammer, pry or pull the work loose from the magnetic chuck.

Neu-T-Rol saves time; saves chuck faces; saves chance of operator injuries; saves warped, bent or broken work pieces and in many cases eliminates a separate demagnetizing operation.

Many manufacturers now furnish grinders with Neu-T-Rol built in, or will so equip new machines if you just specify "Neu-T-Rol". There is a Neu-T-Rol for every size of magnetic chuck.

We also make a full line of industrial a-c d-c rectifiers.

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should be taken to see that the lap approaches the work with as little pressure as possible. Wherever work is to be ground to accuracy in the small diameters, there appears to be no better medium. For the sizing of spring chucks and other small chucking devices, no more satisfactory method has been developed, not only for an occasional application but also for production of a standard product.

The charging of flat laps consists of moistening the surface of the lap with a few drops of pure olive oil, and evenly distributing dry diamond powder over its surface. If the grain size of the powder is No. 1 grade or larger for coarse grinding, it should be lightly tapped with a small, flat hammer to drive the diamond particles into the surface of the lap. It then should be thoroughly rolled by hand on a bench or, better yet, in a lathe, holding the handle of the roll in the tool post, with the steel roll pressing flat against the lap, and using the cross slide of the lathe to move the roll over the surface of the lap.

The roll, mentioned for this purpose, may be bought from diamond cutting supply houses, but, being a simple device, may readily be made without much trouble. It consists of a hard steel roller, approx. 1¼" dia. and approx. 1½" long, with a 60° center bearing at each end, and supported in a frame on pivots, engaging the roll at each end. The roll should be hardened to approx. 64 Rockwell C, and ground to a smooth surface in order to prevent diamond particles from adhering to the roll instead of sinking into the lap.

Small pin laps, used for lapping small holes, are generally charged with the finer grades of powder. The charging of the lap is usually accomplished by rolling the lap between two hardened steel plates or blocks, exercising care with the smaller sizes up to, say, 1 mm. The diamond powder is placed on the lower plate and moistened with a little olive oil. In general, 10 to 12 drops of oil per carat of diamond powder will be found about the proper consistency for the work. Afterwards the lap is placed upon this and rolled back and forth by moving the upper plate, which rests upon the lap.

Introducing JESSOP MALTA CARBIDE TIPPED TOOLS

ENTERING the field of Sintered Carbide Tools, the Jessop Steel Company now offers a line of ten different types of tools, with a selection of three grades of carbide tips.

These tools make their appearance in the colors of the day—red, white and blue. Thus, the ends of the tool shanks will be painted with a distinctive color to identify the particular grade of carbide used on the cutting tip. This will aid the machinist in selecting the proper grade of carbide tip to fit the job and eliminate the possibility of using the wrong tools on applications where another grade of carbide should have been used.

Known as the "J. C." series, Jessop Carbide Tipped Tools are stocked in a wide range of sizes, both at the mill and in warehouses.

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A high production carbide for finishing hard abrasive irons and non-ferrous and non-metallic materials — used for turning, facing, boring, and reaming.

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For high speed production cutting of all types of steel—also used on non-ferrous materials.

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Closest approach to universal grade for heavy interrupted cuts on Armor Plate, Soft Steels, Cast Iron, etc.

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Established 1901

The use of tool steel for laps is not recommended, because, in many instances, it is too hard to fasten the diamond particles properly upon the surface of the lap. With laps of larger diameter, say, about 3/16" and up, the surface of the lap may be grooved by carefully cutting longitudinal grooves with a small tool. And remember, the more grooves, the better the lap will function. The groove should be cut in such a manner that the bur thrown up will securely embed the diamond grains used. The procedure is as follows: Fill the grooves with diamond powder, moistened with olive oil. No. 1 and No. 2 grades of diamond powder are a desirable size for use on this type of lap; coarser grains work satisfactorily with this lap when extra heavy cutting is required. After filling the grooves with diamond powder, place the lap upon a steel block and peen with a small hammer in order to close the grooves. The hammering may force some of the diamond powder below the surface of the lap, but these particles will later be exposed on the surface due to wear, and work very efficiently in subsequent lapping operations.

Needle laps, to be held by hand in lapping or polishing, may, at the start, be charged by the rolling method and, when in use, small amounts of the powder may be applied to the surface of the lap, relying on the pressure between the work and the lap to fasten the diamond particles.

The grade of diamond powder determines the type of cut or finish. No. 1 or coarser grades will give cuts that show roughness, while Nos. 2, 3, and 4 grades will give finishes in proportion to the grain sizes. The finer sizes are distinctly finishing sizes, and the type of finish plus the proper grain size can best be determined by experiment.

Flat laps and pin laps of the large diameters should, after charging, be washed off in order to prevent the throwing of diamond powder and oil upon delicate parts of the lathe. This washing may be done with benzol, and by decanting off the liquid, the washed-out particles may be preserved for future use. The washings should be regraded so that the particle size of the powder is definitely maintained for future charging operations.

The employment of pure olive oil for moistening the laps and the dry diamond powder has previously been stressed. While pure olive oil, has been used for this process for years, certain oils of neutral character have recently been developed, due to the dearth of pure olive oil. These function as well and may, in time, come into general use.

Courtesy—"Diamonds in Industry" published by J. K. Smit & Sons, Inc., 157 Chambers St., New York, N. Y.

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PRECISION TAPPER
Taps guided by precision leads, Class 3 & 4 specifications easily met. 4 speeds. Ball bearings throughout. Available as floor model (with coolant system) or table model; also automatic air stop for bottom tapping.

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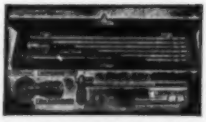
Highest accuracy and finest workmanship. Available 1½"—6" & 1½"—12" sets.



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50% — OR MORE!

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Opens and closes full range instantly. Locks and unlocks with half-turn.
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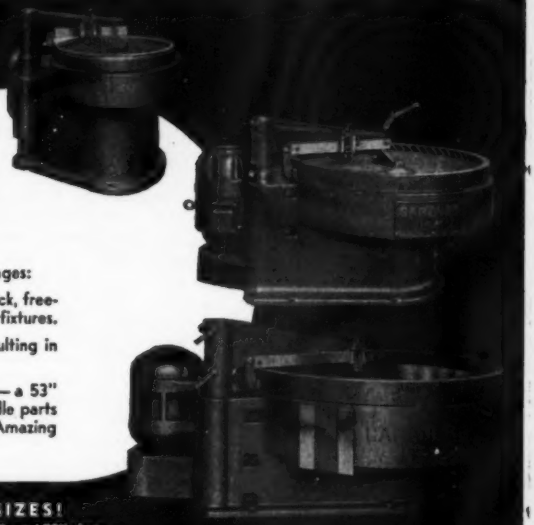
Economical Flat Surfacing with these *Modern* Horizontal Grinders!



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This method has 3 big advantages:

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3. Almost unlimited capacity — a 53" machine, for example, can handle parts 2" square, and parts 30" long. Amazing versatility!

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Available in 18", 30", 36", 53", and 72" sizes — this data indicates production possibilities!

FIG. 1. Gear cases, covers, and doors cleaned up on a 53" Gardner Grinder at rates ranging from 7 per hour to 40 per hour.

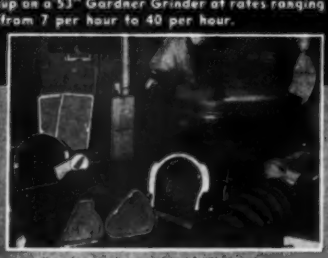
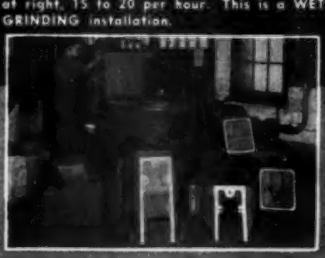


FIG. 2. Motor cabinet legs for a well-known lathe, ground at 4 to 5 per hour. Door covers at right, 15 to 20 per hour. This is a WET GRINDING installation.



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YOUR TAX PROBLEMS

By ARTHUR ROBERTS

THE size of your tax bill depends to a large extent upon the accuracy and adequacy of your accounting system. In too many instances, the systems employed by machine tool users need modernization. It is common knowledge that the costing methods in many plants have long needed overhauling. Even in prewar days, managements were utilizing standard costs that were compiled years before and badly in need of revision upward to assure reasonable profit. Since the war, costs have "upped", which coupled with shortages, wartime restrictions, all-out production and inexperienced help, have sent operating ratios "haywire".

The postwar period will not terminate our distorted economy. Many moons will pass before conditions stabilize and business may never return all the way to the modus operandi of prewar days. Business has entered a new era. Managements must scrap their antiquated accounting systems for more adequate means of computing selling prices, costs, overhead, net profit and tax. Machine tool users have frequently informed us that they had been using the same accounting systems for years. They have regarded the systems as highly satisfactory, not realizing that accounting systems can become antiquated, inefficient and costly just like machines. Cost systems must keep pace with the times. Some managements would not think of using production machinery as outmoded as their accounting systems. Modern machinery can deliver profitable production only if your accounting system can figure production profitably.

It is not my purpose here to give specific advice on how to modernize your bookkeeping methods. All plants differ in this regard. That work must be done by your accounting staff or outside experts. I haven't the space to provide such information but I want to emphasize here, that aside from the benefit to your busi-

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For "A" section V-belts—3.3.—1 speed range—perfect belt alignment in all positions. Priced so low that no shop or machine need go without infinite speed selection. *See your dealer or write* $16.50

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Accurate Hole Transfer Made Easy With NIELSEN TRANSFER SCREWS

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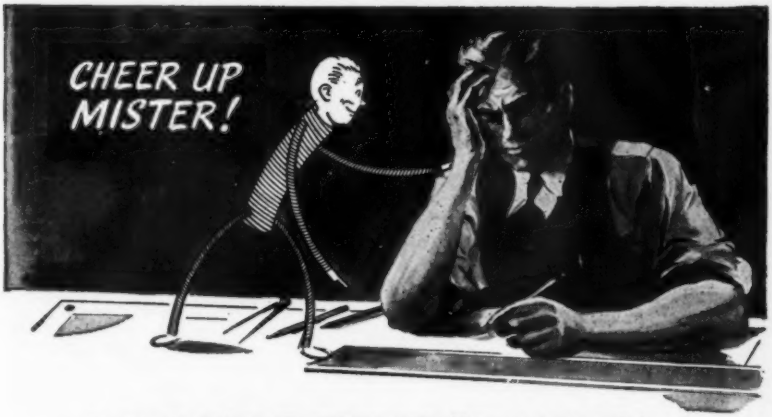
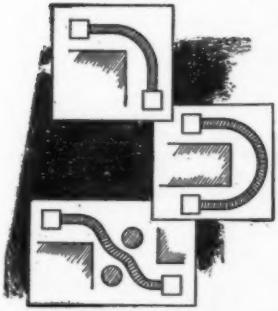


an S.S.WHITE FLEXIBLE SHAFT
is the answer to that drive problem



Drive or remote control conditions like those sketched are duck soup for S. S. White Flexible Shafts.

Yes, when your problem is the mechanical transmission of power, an S. S. White flexible shaft may well be the answer —and just about the simplest answer you can get—a single, easily applied element that will take power from your power source and deliver it to the part you want to drive wherever that part may be located. Turns, obstacles or distance make no difference to a flexible shaft.

The wide latitude a flexible shaft gives you in the placing of driving and driven members often enables you to work out more efficient designs, and its simplicity means faster production and lower costs. There are hundreds of applications to prove it, in aircraft, motor vehicles, radio and electrical equipment, stoves and ranges, machine and portable tools and a wide variety of other products.

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BULLETIN 1239—Power Drive Flexible Shafts.

BULLETIN 38-42—Remote Control Flexible Shafts.

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Call in the Dolge Service Man in your locality. *Without charge* he will send samples of your coolant as used at the machines and from the original drum to the Dolge laboratories. There the bacteria count is determined, and a complete, confidential report submitted to you.

Where bacteria count is significant, Dolge recommends a tailored-to-fit germicide under the brand name of STERIDOL. It's compounded to meet your particular shop conditions. There's no need to have spoiled coolant . . . to waste war essential oil . . . to have costly production delays by frequently changing coolants.

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For cutting oil sanitation

DOLGE

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The C. B. DOLGE Co.

Westport, Connecticut

ness from the standpoint of pricing, costing and profit, your accounting system should be reviewed minutely so that you do not overpay or underpay on taxes. On the one hand, you may lose money. On the other, you may be penalized by the Treasury Department. From field observation, I would say that a large percentage of machine tool users are harboring accounting systems that need overhauling. Otherwise, eventually they will find themselves in the "doghouse" on taxes in one way or another.

Uncle Sam, remember, demands accurate accounting. He does not specify the method, but insists that the accounts reflect income and outgo accurately. The high rates in effect today will result in closer inspection of taxpayer's books. Hence, machine tool users should review recording practices now, improve them where necessary or install adequate systems if they have been using faulty debit and credit techniques.

The payroll systems, for one thing, are off-center in many plants. They were all right before social security withholdings began. Today, the employers must make many deductions for income tax, social security, state unemployment, bonds etc. In many cases, these deductions are kept in separate accounts in the books, not for each individual employee, as is desirable, but in a lump sum for all withholdings. The law demands that you be in a position to provide an employee with a report of withholdings at any time, and you must keep your records accordingly. If you discharge an employee or he leaves, can you give him a statement of earnings and deductions as required by law? Can you give each employee a statement of total earnings and deductions by the 31st day of January, the month following the fourth-quarter on form W-2? Can you do this work in a few moments or will it take you hours to dig up the information from your books? You can, if your system has kept in step with the times.

If your costing system is an heirloom, obviously, you may overpay or underpay taxes because your costs will not be accurate. If you are working on war production, this defect may not be noticeable now because capacity output begets

PRECISION CENTERED EYE BENDING

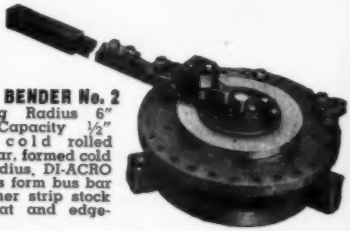
with

DI-ACRO BENDERS

A Centered EYE in 1 Operation

The DI-ACRO Bender makes perfectly centered eyes from rod or strip stock at the rate of up to 1000 an hour. Both eye and centering bend are formed with one operation. Any size eye may be formed within capacity of bender and ductile limits of material.

BENDER No. 1
Forming radius 2" app. Capacity 7/32" round cold rolled steel bar or equivalent. All DI-ACRO Benders have two-way action, right or left hand mounting and reversible forming nose.



BENDER No. 2
Forming Radius 6" app. Capacity ½" round cold rolled steel bar, formed cold to 1" radius. DI-ACRO Benders form bus bar and other strip stock both flat and edgewise.

DI-ACRO precision bending is accurate to .001" for duplicated parts. DI-ACRO Benders bend angle, channel, rod, tubing, wire, moulding, strip stock, etc. Machines are easily adjustable for simple, compound and reverse bends of varying radii.

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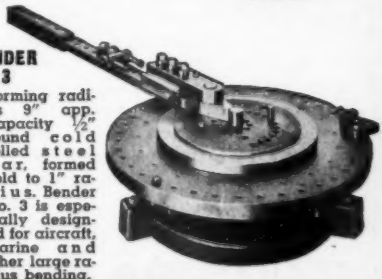
"DIE-LESS" DUPLICATING
showing many kinds of "DIE-LESS DUPLICATING" produced with DI-ACRO Benders, Brakes and Shears.



BENDER No. 3
Forming radius 9" app. Capacity ½" round cold rolled steel bar, formed cold to 1" radius. Bender No. 3 is especially designed for aircraft, marine and other large radius bending.

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O'NEIL-IRWIN MFG. CO.

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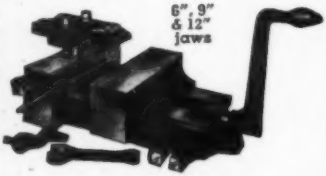
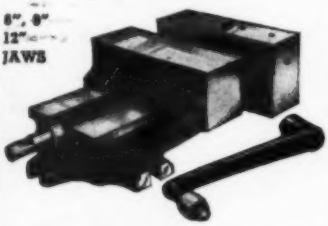
HANDLING A WIDE VARIETY OF WORK



GRAHAM MULTI-PURPOSE VISE



Sold complete with Jig Attachments, or plain (drilled ready to receive attachments) the Graham Multi-purpose Vise is suited to a wide variety of work on a wide variety of machines. By means of special V-jaws, stops, guides, etc., these tools are able to accommodate innumerable types of work, for both single or repeat-operation drilling, where special jigs or fixtures would otherwise have to be made. Furnished in three sizes, up to a heavy 122 lb. model, this Vise serves on almost any type of machine: planer, shaper, radial, miller, grinder, drill press, etc.

Request Illustrated Price Circular.

GRAHAM MFG. CO.
57 BRIDGE ST. EAST GREENWICH, R. I.

a low overhead charge, which may camouflage costs temporarily. But the axe will fall sooner or later. If you find you have overpaid on taxes, it may be too late then to get reimbursement. Selling and collection expense are practically nil for plants working for Uncle Sam. This saving tends to offset losses due to inaccurate costing systems, inflating your profit on paper and increasing your tax bill. When the rates were lower, this defect was not so costly but with the rates in the sky today, you have a more serious proposition on your hands. When war orders stop and you must dig up your own business, then promotional expense will increase. With reduced volume, overhead per sales dollar will also increase. Then you may find that your selling prices or estimates of war days were not so profitable as you thot, but you didn't realize it because of an inadequate accounting system and paid taxes out of capital.

Manpower and materials are scarce and have jumped substantially during the past couple of years. This necessitates careful computation, planning and analysis to assure accurate costing of production. Antiquated systems of accounting, relics of more stable days, are inadequate to handle the many revisions in costs that have come about since the war began, sometimes overnight. And stability is a long way off. Costs will "jitterbug" long after war's end. New products coming into the field, radical developments, untested markets, all mean experimentation to determine whether selling prices are right for profitable sales. Now is the time to overhaul your accounting system to see whether it accurately reflects income and outgo, so that for the remainder of the duration and postwar period, you will pay the correct tax on income.

One item that demands careful scrutiny is depreciation, particularly if you are operating full blast. Before 1940, comparatively few plants were averaging more than eight hours daily. Now many shops are running 24 hours a day. If managements do not give depreciation a careful checkover, this charge may be underestimated, likewise, production costs—and the tax expense increased.

The trend after the war, according to

GIVE THEM THE BEST

Give Them Air Tools

The cost of power for any portable tool is small when compared with the operator's wages. Therefore, consider aiding your operators by giving them smaller, lighter and more powerful AIR tools which will enable them to do an easier, quicker and better job.

Flexibility of AIR Power . . . More types of work can be done with AIR tools than with any other type of portable tools. Their wide range includes not only rotary applications (such as drilling, reaming, grinding, nut running, etc.), but also such percussive applications as riveting, chipping, ramming, tamping, etc.

Flexibility of Control . . . AIR-powered tools can be started and stopped instantly—this speeds up repetitive operations. Torque and speed can be varied throughout the capacity range—full power can be obtained immediately. This control permits the operator to fit the tool exactly to his work from moment to moment.

Flexibility of Application . . . Flexible control automatically gives the AIR tool wide application. It can be used on a great variety of materials—it will handle numerous types of jobs in any shop.

Choose from the complete line of I-R AIR tools . . . and increase your production.

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some authorities, will be toward lower prices. This will apply particularly to durable goods so that sales resistance will be reduced to minimum. Sales volume, employment and income will be tops. How else, they argue, can we carry the tremendous tax load unless income is also in the clouds? High prices, beyond the pocketbooks of many, will not produce topflight production, employment and income, but lower prices will. Set prices, they demand, so that every Jeter Lester on Tobacco Road, can have an electric refrigerator and pigeon blue bathtub. That will revolutionize costing processes in all plants, if it comes to pass. It will make income tax preparation hard for managements using "horse and buggy" accounting systems. Instead of computing costs first and then setting the selling prices, as is now the practice, such a reversal in price trends will compel manufacturers to set the selling prices first and then utilize the most efficient managerial methods in production and marketing to keep costs in safe ratio to sales. That's the way Henry Ford says he has always worked, contending that if you gear selling prices low enough to get substantial sales volume, the costs will take care of themselves and you know what the Fords did to the general price level on cars years ago.

All this has a bearing on taxes. It means that in the new economy, already operating and carrying over, all or in part, to the postwar period, your accounting system must be able to reflect the change. It must be modern and flexible, otherwise, it will crack, deliver erroneous results and give you tax headaches.

An antiquated accounting system means that the foundation of your income tax statement is faulty. Hence, no matter how carefully the return is prepared, you can't hope for accuracy.

EARLY DISTRIBUTION OF W-2 FORMS

Bureau of Internal Revenue is impressing upon management, the importance of early distribution of Form W-2 to employees. This form is a statement showing total wages paid during calendar year 1943 and amount of income and Victory tax withheld from such wages under provisions of the new "pay-as-you-go" income tax plan.

January 31, 1944 is the deadline for distribution of forms to employees and for filing by employer of duplicates, together with employer's quarterly report of taxes withheld (W-1) with the Collector of Internal Revenue in employer's district.

Next year, 50 million people will be required to file income tax returns, it is estimated, and the task will be more complicated than ever before.

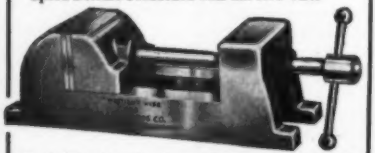
Employers will be supplied with copies of W-2 Form by the Collector of Internal Revenue. Form requires these simple facts:—(1) name of employee, complete address and Social Security number, (2) name and address of employer, (3) amount of wages paid the employee during calendar year 1943, and (4) amount of income and Victory taxes withheld during calendar year 1943. Distribution of the forms early in January is highly desirable.

Over in Britain, they're re-using envelopes several times to conserve paper. Uncle Sam needs paper.

Don't Waste it!

DOUBLE YOUR DRILL PRESS CAPACITY

Minutes are Seconds with the new TWISTITE Vise. Opens to full capacity in one second. Speed Defense Production with this New Vise.



J. A. Richards Co., Kalamazoo, Mich.

BREMIL MFG. COMPANY

1700 Pitts. Ave., Erie, Pa.

ALL-ALLOY compound lever strap cutter. Cuts 1¼ strap with one stroke.

THEY FLEW FOR 2 MINUTES . . .

"Boeing 314 Clipper" (Pan-American)

TODAY . . . *We Span the Oceans*

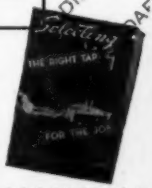
The contrast in performance between now and the first days of airplanes is one way of looking at their amazing progress. But it's *not* the most vital difference. The real difference between today and 1903 is that today we can build 8000 planes a month.

What has brought about this progress? Mass production? The assembly line? Yes, but before these were possible, there had to come STANDARDIZATION — the adoption of standard interchangeable parts which would assemble instantly without "hand fitting." This basic feat with its attending economies has made available to many, in all fields, products that were formerly available only to a few.

The use of *standard Screw Thread forms and sizes* has contributed enormously to this simplification of manufacture. A more universal adoption of these standards can carry their benefits still further in the years immediately ahead.

Standard Threads— SAVE TIME - SAVE MONEY!

Full utilization of existing accepted sizes, pitches and forms can bring lowered costs to all manufactured products because: (1) it speeds production; (2) it reduces inventory. NOW, when plans for new and better products are taking shape —now is the time for a united effort to bring about greater standardization of threaded parts



Send for booklet "Selecting the Right Tap for the Job"—18 pages of Facts, Tables, Suggestions

GREENFIELD TAP AND DIE CORPORATION GREENFIELD MASSACHUSETTS

FONDA
PRECISION GAGE BLOCKS

IMMEDIATE DELIVERY

SIZE—FONDA GAGE BLOCKS are lapped and inspected under standard temperature (68°) in a most modern plant.

PARALLELISM AND FLATNESS — FONDA GAGE BLOCKS are parallel and flat. The FONDA designed lapping equipment used in their manufacture does away entirely with the inaccuracies of lapping by hand.

SURFACE FINISH — FONDA GAGE BLOCKS have a truly remarkable surface finish which is unlike that of any other block. This superfinish means resistance to wear as the surface of the block is free of peaks that wear off in use.

STABILITY — FONDA GAGE BLOCKS are stable. Scrupulous care and much time are expended on the extensive processing to ensure stability.

FONDA GAGE BLOCKS are available in Inspection and Working grades at the prices shown. Immediate delivery can be given at present.

PRICES

Inspection Tolerance ± .000004"
82 Unit Set.....$350.00
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TEN UNIT POCKET SET
Giving 327 Possible Dimensions Obtainable

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THE NEW Cal-Cutter Catalog—just off the press—supersedes the catalog you now have and is ready for mailing. It's more complete than ever and contains valuable data you should have on the latest Cal-Cutter designs for milling steel, dural, aluminum, bronze, brass and other metals.

Gives helpful operating tips on how to get more production, longer runs, higher speeds and feeds, better surface finish, lower cost-per-piece from these carbide-tipped milling cutters. Includes detailed specifications and ordering data.

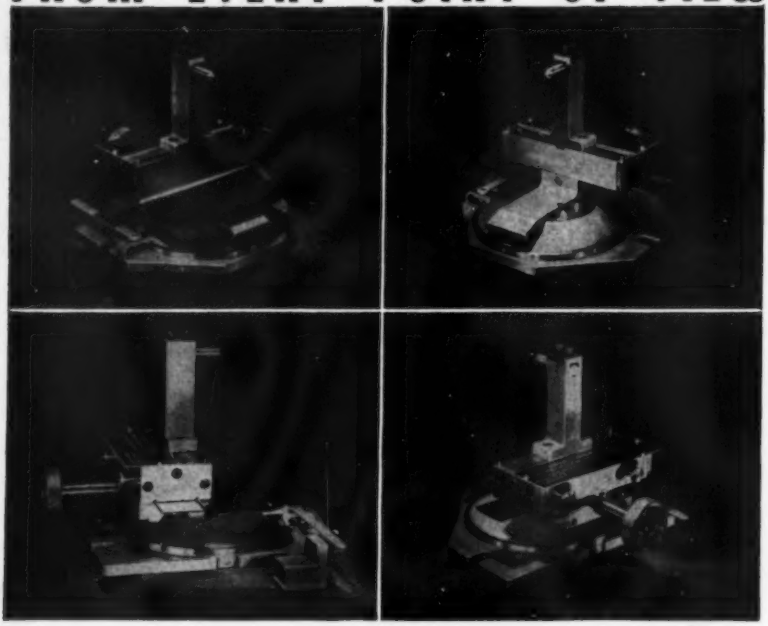
Your copy is ready!

ask for Catalog 381-H. Write today.

MACHINERY MANUFACTURING COMPANY

Vernon Line of HORIZONTAL MILLS, VERTICAL MILLS and JIG BORERS, SHAPERS and GRINDERS

FROM EVERY POINT OF VIEW



Whether the wheel dressing job to be done is simple or complicated, fine or rough, large or small, from every point of view, the Vinco B-1 (Angle Tangent to Radius) Dresser is the one to use. Grinding wheels up to 14" in diameter may be dressed, either convex or concave with radii up to 2½" diameter with any combination of angles tangent to any radius. The B-1 Dresser may be used on practically all surface grinders and on external, internal and cutter grinders (in some cases, Vinco special Sub-Bases must be used). You can't go wrong with a Vinco B-1—and you can get immediate delivery from stock.

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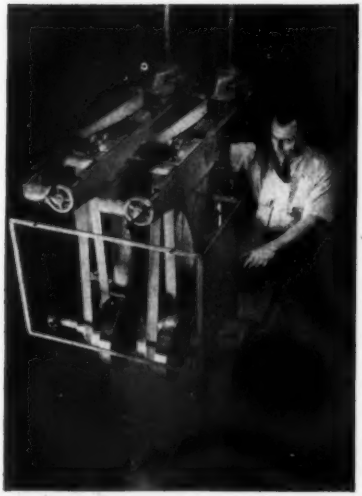
Semi-Automatic Hydraulic Spline and Gear Grinder • Optical Master Inspection Dividing Head • Involute Checker • Angle Tangent to Radius Dresser • Index Plates • Precision Vises • Sine Bars • Straight-side Spline, Serration Spline, Involute Spline and Helical Spline Plug and Ring Gages • Thread Ring Gages and Masters • Spur and Helical Master Gears • Munition Gages • Propeller Hub Gages • Built-up and Special Gages • Gear [illegible]

SPLICING WOVEN COTTON BELTING

RATHER than replace old belt-driven machine tools forced into service by demands of war production, Westinghouse attempted to get the most out of these machines by improving existing drives as much as possible. Max Kholas, Westinghouse beltman, devised a method of splicing woven cotton belting, later perfected by Westinghouse engineers.

Belt life has increased by three times on this 6-spindle drill press, with less belt slippage and reduced drill breakage.



Cemented cotton belting used on a sensitive drill press. Belts shown are some of the original test belts, operated for over three years.

He was granted a patent on this process which provides a satisfactory flat belt drive using no critical materials. It increases production because of reduced slippage and less machine down-time due to broken belts, and saves time of both operator and maintenance men. In addition, it is less costly than other belting.

Westinghouse uses this type of belting on such machines as sensitive drill presses, multiple spindle drill presses, profilers, screw machines, grinders and for other types of drives, including heavy duty air compressors and belt conveyors. Belt sizes can range from ⅜ to 84" in width; from two to eight ply in thickness, and in any length.

The method of cementing the belting is quite simple and is done without special tools and expensive equipment. The actual splicing can be done right at the machine where the belt is to be used. This permits use of cemented belting, having the advantages of endless belts, on machinery and equipment so constructed that endless belts cannot ordinarily be used.

For power transmission purposes a special belt, woven to Westinghouse specifications and using an "inner bound" weave is required. This type of weave permits high flexibility and prevents the plies from separating should the surface

Cemented belts are used on this grinder, with a spindle speed of 18,000 rpm. Belts can be shortened and replaced if they should stretch.

threads become worn or broken. It is essential that this type belting be used, as many woven belts do not have the tensile strength for power transmission, nor are they of the proper construction to permit splicing.

The actual splicing procedure is somewhat similar to the method used in splicing leather and rubber belts. The belt is first cut to length, allowing for the splice and deducting for stretch. The ends are tapered to a feather edge with each ply being step cut. Next the ends are prime coated with a solvent and cement solution. After drying (5 to 15 minutes), a sheet of cement which has been immersed in solvent is placed between the ends of the splice and the belt is then securely clamped and allowed to dry.

Drying time varies with the size of belt and room temperatures. At a room temperature of 72° F the clamps may be removed from a 2" wide, 4 ply, belt after 15 minutes of drying. About 20 minutes more of drying should be allowed before the belt is used. This is necessary to permit the solvent to dry thoroughly. The entire cycle from cutting the belt to the time it can be used is about 30 to 40 minutes for a 2" wide, 4 ply belt.

To save time on the most critical machines, belts cut to length with ends tapered are carried in stock. Temporary, mechanically fastened belts can be used while the new cemented belting is being prepared.

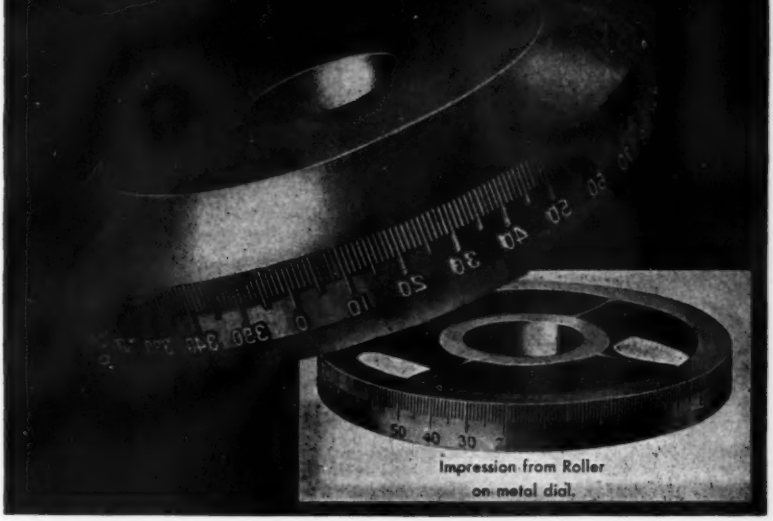
A better finish was obtained with this surface grinder when cotton belting was applied. Used 24 hours a day, seven days a week, belt life averages two months.

From material presented by R. W. Mallick, Headquarters Manufacturing Engineer, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., at the recent Milwaukee ASTE meeting.

365 MAN-DAYS OF PRECISION PRODUCT MARKING

complete in 2 days

. . . WITH LESS THAN 0.4% REJECTS



Impression from Roller on metal dial.

This job called for calibrating 600 expensive dials. Extreme accuracy and minimum waste were essential. We estimated the job would take a full year for engraving!
Sossner master craftsmen produced a roller stamping die that turned the job out in less than 2 days! 598 out of the 600 dials passed the rigid inspection. Our customer saved both time and money. Let us duplicate this saving on all *your* marking requirements.

SOSSNER

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TAPS CUTTING TOOLS
STEEL STAMPS GAGES

BIG JOBS

little things with

Ultra smoothness and extreme accuracy in the mechanical world mean more efficient operation, more dependability, longer life.

It is the *forte* of honing and superfinish stones to create ultra smoothness and extreme accuracy; to create those physical attributes far beyond the capacity of anything else man has yet contrived.

MID-WEST MICRO BOND honing and superfinish stones have blazed many new trails in the field of superb finishes and extremely close tolerances. Many of Uncle Sam's weapons of war—tanks, guns and planes—owe a portion of their deadly efficiency to a MID-WEST honing or superfinish stone often smaller than a match. Truly such tiny items are little things with big jobs!

MID-WEST honing and superfinish stones—*the world's most efficient abrasives*—come in any size, any shape, any grain, any grade. They last longer, cut faster and produce smoother surfaces with less heat.

MID-WEST ABRASIVE COMPANY

Manufacturers of DEPENDABLE Abrasives

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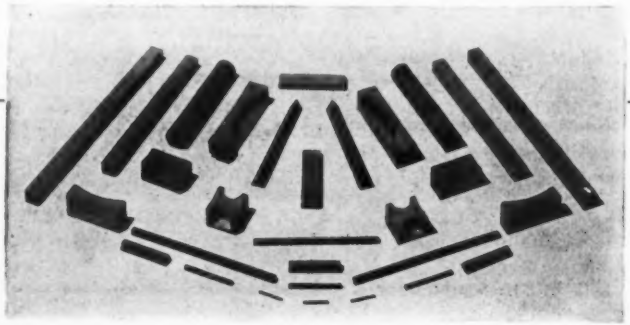
MID-WEST'S complete line of abrasive products also includes grinding wheels for any purpose, coated abrasives of any type and compounds. Let a MID-WEST service engineer tell you what MID-WEST abrasives have done for others. You'll be amazed!



Let's Talk Shop

IMPORTANCE OF PROPER HEAT TREATMENT

MANY articles have been published on designing, grinding and using tools. There have been many warnings about the abuse of tools. Many appeals have been made for tool conservation. A mighty important point that has not received the emphasis it deserves is heat treatment. Yet improper heat treatment has caused loss of time, effort and material amounting to a staggering total.

The average tool designer sees only an occasional example of the point I'm driving at, so he is not impressed. It's quite a different matter from the standpoint of the professional heat treater handling hundreds of jobs every day. These jobs involve almost every known brand of steel, in all sizes and shapes, and a wide variety of treatments and a broad range of desired results.

To start with, let us say that theoretically, the tool engineer is called upon to produce a tool for a given job. Usually he is capable of selecting the right kind of steel. He not only chooses steel which can be fashioned into the desired shape, but one which will withstand the heat treatment necessary to provide it with the proper hardness and physical properties for the job. Then he machines the tool and hands it over to a hardener to treat in accordance with approved practice for the steel and the job. When it has been finish ground, it is put to work and should perform as intended.

A lot of tools don't get that far. They are doomed to quick failure because the wrong kind of steel is used. I need not dwell on this because any tool engineer can get information and guidance from a steel supplier or his heat treater.

I might say in passing that there is no reasonable excuse for the many items and parts sent out for case hardening, of one kind or another, which have too high a carbon content for such treatment. Or for using a water hardening steel to make tools with light and heavy sections that tend to split apart when quenched. There are many oil hardening steels made for

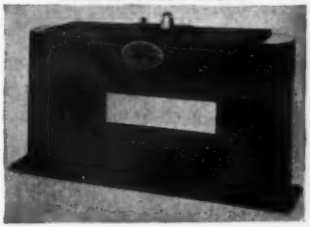
C-master Demagnetizer 811

one pass through demagnetizes

This heavy duty unit combines careful scientific construction with extreme portability. Can be plugged into any electrical outlet. Voltage 110-115 AC. Inside spacious opening 3⅜"x10¼". The lighthouse beacon pilot light is an exclusive feature, the red glow being visible from all sides and warning operators to shut off unit when not in use — thus adding many years to life of machine.

Sold by leading Mill Suppliers
Distributed by Graybar Electric Co.

Exclusive Feature
BEACON PILOT LIGHT



ULLMAN PRODUCTS CO. 859 Fourth Ave. Brooklyn 32, N. Y.

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INDUSTRY'S NEW SET OF TOOLS
Write for Literature on above Products to
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and Soluble Oils
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Band Files
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GAGE BLOCKS with Instruments
POWDER METALLURGY
Metal Powders
and Equipment

just that work. Another case may involve some thousands of stampings from low carbon steel which somebody wants hardened into springs.

There is an ever widening gap between the man who produces the tools and the man who hardens them. Originally the functions were part and parcel of the tool making trade. Nowadays they seldom are. Tools are made in one department and hardened in another, or perhaps in an outside heat treating plant.

Most tool engineers recognize that before the heat treater can do a proper job on any piece of steel, he must know the nature of the steel. This doesn't require detailed written analysis. Given the brand name, the SAE or NE number, the heat treater knows the rest of the story. or where to get it. Moreover, he knows what the steel will stand and usually, if he knows the use to which it will be put, he understands what is best in the way of hardness and physical characteristics for the job.

What happens in thousands of cases is that somewhere between the time a piece of steel is cut from the bar in the storeroom, and the time it is ready for heat treating, all trace is lost of the brand or kind or there is a mixup. When the tool reaches the hardener he is given no information, or worse, information that is entirely wrong. If no information accompanies the job, the professional heat treater endeavors to identify the steel. This may involve serious loss of time, even if the correct information is ultimately obtained.

There is a notable exception — when firms send steel to be carburized, this is usually done without question because it's assumed they would not send steel with a high carbon content. Quite often tho, such items fracture and the structure shows plainly the steel should never have been subjected to any such temperatures. Mutual conviction on this point does not replace the time and material lost thru someone's lack of understanding or carelessness.

The heat treater is in the clear because he cannnot always tell the kind of steel he receives. Even if he could take the time to spark test it, that is not absolutely dependable. Some oil hardening steels, for example, throw a spark similar to

. . . and remember that CHUCKS are TOOLS

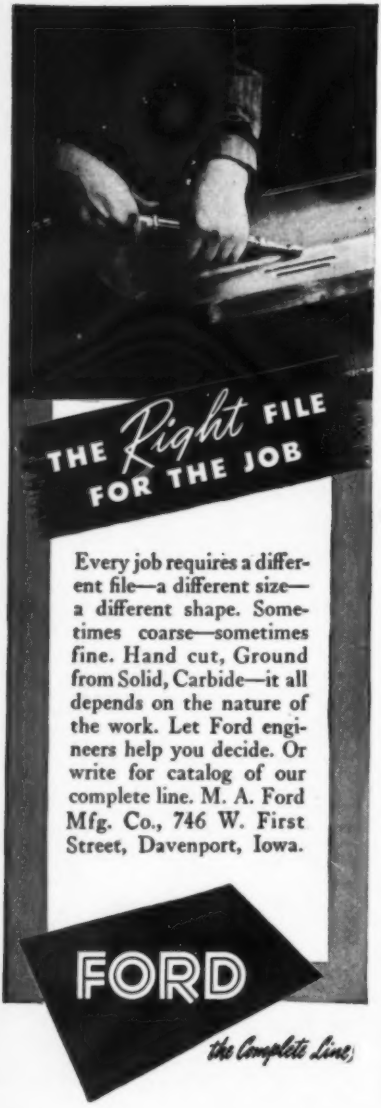
If you break a mirror, that is considered bad luck. But the actual loss is only a piece of glass and it can be replaced. When a critically needed cutting tool or an equally essential chuck is ruined, the loss is not limited to a single unit, hard as it may be even to replace that unit. You also lose the continuing stream of urgently needed war materiel that tool or chuck could have produced, had it been kept on the job.

All of us have a job to do in seeing to it that tool-power as well as man-power is carefully conserved and efficiently maintained for maximum output with minimum waste. We are more anxious to help you keep present Cushman Chucks on the job, producing to capacity, than we are to supply you with new ones. We urge you to call every operator's attention to the simple rules of good chuck maintenance that will prolong service life and retain initial high accuracy. These rules have been briefed on small "Chuck Check" cards which we will be glad to supply upon request for distribution in your plant. Also feel free to consult our engineering department freely on any special problems that may come up. The Cushman Chuck Company Hartford, Conn.

Send for these "Chuck Check" maintenance cards today.

CUSHMAN

A World Standard for PRECISION


THE Right FILE
FOR THE JOB
Every job requires a different file—a different size—a different shape. Sometimes coarse—sometimes fine. Hand cut, Ground from Solid, Carbide—it all depends on the nature of the work. Let Ford engineers help you decide. Or write for catalog of our complete line. M. A. Ford Mfg. Co., 746 W. First Street, Davenport, Iowa.
FORD
the Complete Line

that obtained from straight carbon steel.

Frequently the kind of steel indicated proves later to have been something entirely different. This is found out after heat treatment and seldom before. The tools and parts usually are treated for whatever the customer says they are.

If they happen to be heated below the proper degree, the steel just doesn't respond and it remains soft. Then it is necessary to anneal and reharden the steel again and again, at the customer's expense, until a treatment is found approaching the customer's requirements. But that sort of thing does the steel no good—it means a marked lowering of efficiency and the time lost is too valuable these days to spend in any such way.

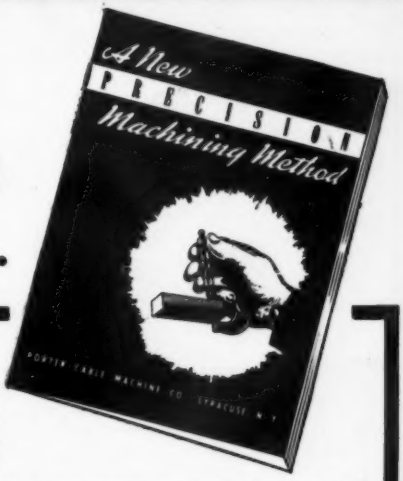
There are something like 8,000 brands of steel. For each of these is a treatment that is best for a given job. Seldom is the heat treater told how the tool is to be used and he cannot always guess correctly. This makes quite a difference. I understand that an extra coat of paint on an airplane may slow it down as much as 15 miles per hour. The difference between the right kind of a hardening job and a mediocre or less suitable one, is comparable.

There is a lot of difference between heat treating for hardness and heat treating for toughness. Many tools now in use are too hard. They would be better at around 59 Rockwell C, but the customer, because he can file steel up to 60-61, thinks he is gypped if the tool can be filed.

More information is needed on certain types of steels than on others. Straight water hardening steels harden at about the same temperatures. However, there are many varieties of oil hardening steels which may be treated at from 1400 to 1850° F. Obviously, the mere term "Oil hardening steel" is quite incomplete Likewise, the different varieties of high speed steels require different temperatures for hardening. These again are divided into sub-classes and this makes the job still more intricate and exacting. This last, I believe, is the main reason for difficulties experienced with high speed steels.

A customer recently brought us a die made from four pieces of steel welded together. He asked us to harden it but

Learn What WET-BELT SURFACING *Can Do for YOU . . .*



★ More and more applications are being found every day for this advanced machining method that works an entire area at once, that produces final finish while taking the cut, that eliminates heat, dust, distortion, discoloring, fracturing. Wet-Belt surfacing is amazingly fast—5 to 25 times faster than previous methods. It is simpler— often eliminates need for jigs, as well as set-up and lock-up time. It is so accurate that tolerances of .0005" can be held when desired. It enables inexperienced workers to get increased production and superior finish. It can handle many operations now performed on grinders, millers, shapers, planers. It supplements other machines to step up production, reduce costs, and improve results.

The Porter-Cable Wet-Belt Surfacer has been a revelation in many shops. Learn more about it. Send for our new booklet, which is virtually a text-book on the subject. Fill in and mail the coupon right away.

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Mail me free booklet, "A New Precision Machining Method."

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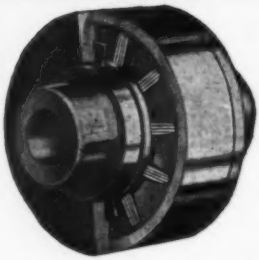
USE CUSHION TORQUE
—IT INCREASES OUTPUT



Kanti-Lever Coupling

If you want steady, uninterrupted production . . . lower machine-repair costs . . . freedom from bearing troubles and shutdowns caused by misalignment, then take advantage of the CUSHION TORQUE developed by the KANTI-LEVER COUPLING. It not only protects you against the evils of misalignment like the ordinary Coupling, but it goes several steps further and protects your Motors and Productive Machinery against the wear, vibration and fatigue that are the source of most machine failures. There is no other Coupling like the KANTI-LEVER . . . it has radial resilient driving spokes of laminated, spring-tempered, 200,000 lb. steel which operate in taper-side slots . . leverage on the spokes automatically decreases as the load increases . . . no end thrust can develop . . . protective stops prevent damage to the spokes from extreme overloads. Over 3,000,000 H. P. in service.

Send for Bulletin No. 28-B.

BROWN ENGINEERING CO., 126 N. THIRD ST. READING, PA.

could not tell what kind of steel any of the pieces were. We used the spark test. One portion apparently was of a mild steel. Another sparked like a water hardening steel. The two remaining ones were obviously of high speed steel. We are still looking for someone who could harden a job of this kind successfully.

Many times in the past we have been given one to a thousand tools or parts identified as high speed tools. Such tools are subjected to high temperatures.

Often it has developed that these tools were not made of high speed steel at all. They were made of some other steel which virtually disintegrated under the intense heat.

Right at this moment there are many vital tools lying in furnaces at excessive heats which will be utterly ruined and made useless because someone mixed up or misnamed the steels.

I have no exact figures on the total volume of tools and parts heat treated each year. High speed steel alone is said to have reached a volume of $400,000,000. That is a small portion of the whole. There is no blinking the fact that this failure to close the gap between the tool producer and the heat treater is causing the loss of many man-hours and the waste of a tremendous amount of strategic material. Most of this waste is preventable. Isn't it time to start doing something about it?

By A. S. Eves, Chief Field Engineer Perfection Tool & Metal Heat Treating Co., 1740 W. Hubbard, Chicago.

SPEEDING ARMATURE REPAIRS

Insulating varnish on rewound armatures is dried in ½ to 1/3 the time by 120-250 watt Westinghouse infra-red lamps. An 18" armature requiring 30 hours in the convection oven is baked in 8 hours under infra-red, while a small 6" armature requires less than half this time to bake out.

First cost and installation time were reduced by using the original brick oven. The old doors were removed, the roof ventilated, and the two banks of lamps suspended on barn door hangers. Each bank of 60 lamps consists of four rows mounted in a semi-circle, with a 27" radius. The barn door hangers permit moving the banks so the lamps may be

THE failure of a single thread in today's super-powered fighting planes may mean the death of a crew of brave American airmen battling in the clouds.

With this sobering thought constantly before us, we, of Cadillac, feel that we would be guilty of criminal negligence, were we to be satisfied with anything less than the highest degree of perfection humanly attainable in the manufacture of the thread gages so extensively used in the inspection of vital aircraft parts.

When life hangs by a thread, precision counts!

CADILLAC
Thread Plug
GAGES

CADILLAC GAGE COMPANY, Detroit

W-S Standard Reamers with carbide tips. Tapered shank (illustrated) and straight shank types. Sizes: ¼ to 1 1/32.

STANDARD REAMERS

available from stock

REAMERS and many other cutting tools, formerly in the "special" class are now STANDARD with us. The majority of these STANDARD cutters is in stock *most of the time*. Our broad line often enables the consolidation of tool orders and saving of valuable time. Each W-S tool is tipped with the correct grade of carbide best suited to do a cutting job on the metals for which the tool was ordered. Carbide tipped tools are not just a specialty with us . . . we make them exclusively. You can expect and *get* uniform, high quality results with W-S tools. Write for new FREE Catalog 144 and latest prices.

WENDT-SONIS COMPANY, Hannibal, Mo.
Branch Warehouse: Long Beach, Calif.

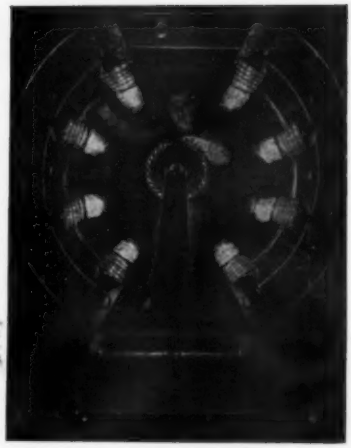
SAVE TIME - - -
wire or phone your requirements!

W-S Carbide Tipped Core Drills available in straight and tapered shanks. Sizes: 1/2 to 1 1/32.

W-S Carbide Tipped Centers available in Morse, Brown & Sharpe and Jarno Tapers.

WENDT SONIS

CARBIDE TIPPED CUTTING TOOLS
REAMERS . CENTERS . CORE DRILLS
COUNTERBORES . TOOL BITS . SPOT
FACERS . END MILLS . HOLLOW MILLS
ROLLER TURNING TOOLS . BORING
TOOLS . SPECIAL TOOLS



placed the proper distance from the armature surface irrespective of its diameter.

Each group of five lamps is controlled by a 20 ampere safety switch and 24 switches provide maximum flexibility of control. The lamps are in three groups of five 15" apart to bake out three armatures simultaneously. The power supply is single phase, three-wire, and the total load is 30 kw. (Photo—Courtesy Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

"WHAT MAKES A GREASE"

No single problem which Industry encounters is so universal and so fundamentally important as the "grease problem." Failure to keep up with new lubrication developments and methods, and the resulting failure to apply the right grease, in the right place, at the right time and in the right way, cause tremendous losses to Industry every year . . . in time, money, materials, motive power and man power.

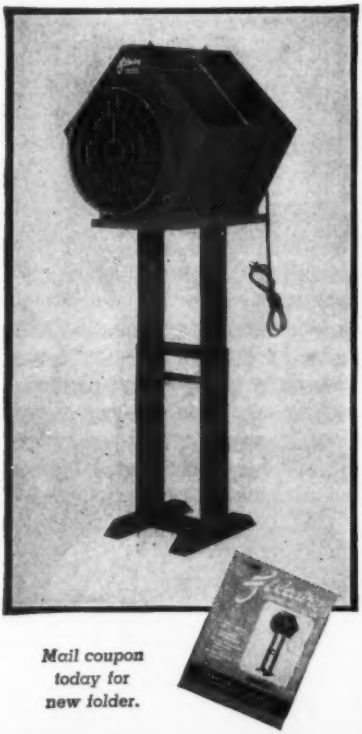
Such avoidable losses, of major proportions even in pre-war Industry, have been multiplied many times under the staggering pressure of war production. Consequently, lubrication is rightfully receiving far greater attention than ever before.

Thru continuous research and development work over a long period of years, the Sun Oil Co., has made many contribu-

Announcing **THE NEW**

NUMBER 2

Filtaire PORTABLE DUST COLLECTOR



Mail coupon today for new folder.

The NEW No. 2 Filtaire Portable Dust Collector has design features that offer outstanding advantages to manufacturers doing dry grinding, polishing, and other dust-creating jobs. This new unit has the fan at the front, two replaceable Dustop filters at the top, and the motor completely enclosed behind a baffle plate at the rear.

The new Filtaire can be used anywhere that a 110-volt outlet is available — it cleans 2000 cu. ft. of air a minute — it recirculates warm air within the shop — it is adjustable for all types of machines — it is sturdy, light weight and portable!

Please send me complete information on the new No. 2 Filtaire Portable Dust Collector.

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STREET .....

CITY..... **STATE**.....

H

EDWARD BLAKE COMPANY

634 COMMONWEALTH AVE., NEWTON CENTRE, MASS.

BLAKE TAP GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS—AMERICAN TOOL HOLDERS—BLACK DIAMOND PRECISION DRILL GRINDERS—L & D HIGH SPEED DRILL PRESSES

PROMPT SHIPMENT FROM STOCK

STEELGRIP Standard Rigid Arm Gear and Wheel Pullers are of improved design. Will not slip from work. Arms are forged and heat-treated. 2-arm, 3-arm and special models. 12 types and sizes.

CHAINGRIP Universal Pullers pull wheels, solid gears, pinions, etc., even at considerable distance from end of shaft. Proof-tested chains have both chain hooks and special pulley hooks. 3-ton and 12-ton capacities.

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All About SPEED REDUCERS

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Catalog quickly shows most efficient types for your applications. Worm, spur, combinations. With Abart power-saving features.

ABART GEARS: Cut to specifications. Ask for estimates.

Type "D W" Parallel Drive, Double Worm Gear Reducer.

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MANUFACTURERS OF Speed Reducers & Gears

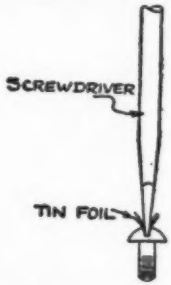
tions to the science of lubrication that have been widely adopted by Industry and have solved the "grease problem" in thousands of factories, mines and shops. As a part of their campaign to improve lubrication methods and practice, the accumulative results of this long experience have been briefly summed up in a booklet entitled "WHAT MAKES A GREASE".

This booklet briefly discusses the standards by which a good grease should be judged. It points out the various factors which should influence selection of the proper grease for a specific job. It describes the outstanding characteristics of the various Sun Greases that have been developed for different uses. It cites specific applications of these greases and results obtained. It explains many varied "grease problems" encountered in every type of plant.

This authoritative little book is "must" reading for any industrial engineer or production man interested in lubrication. A copy may be obtained, without charge or obligation, by writing to the Sun Oil Co., Dept. 26, 1608 Walnut Street, Philadelphia 3, Pa.

SCREW HOLDER

By RONALD EYRICH



Trying to start a screw in a space too small to permit guiding it by hand, can be extremely irksome. This trouble can be overcome easily by doubling a small piece of tin foil once or twice and then folding it over the screw driver bit. Forcing the bit into the screw slot will wedge the tin foil between the two in such a way that the screw will be gripped firmly enough for easy starting.

YOUR BEST INVESTMENT— ANOTHER WAR BOND.

Spirapoint finishes recess and produces radius* *Spiraband* rapidly removes burrs and rough edges*

There's Still Time To Benefit

METALITE CLOTH GADGETS (abrasive) have made almost unbelievable records in speeding up and improving the finish of countless metal parts vital to war production.

Yet one division of a large producer may not be aware that another department has doubled or trebled output simply by adopting these skillfully designed, ready-to-use, abrasive cloth "gadgets" of the exact shapes, the very grits and just the right cushion to snug into any odd shaped part.

So even now, after two years of war, we urge you to send for our booklet, "Blue Print for Faster, Better Production". It is full of illustrations of these new coated abrasives actually at work in large war plants and shows their host of shapes, sizes and grits ready for instant application on many time-wasting operations in your own plant.

Then, to complete the service, if you just give the word, we'll have an experienced field engineer not only show them to you but *demonstrate them on your own jobs.*

Boston, Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Grand Rapids, High Point, Indianapolis, Los Angeles, New York, Philadelphia, St. Louis, San Francisco, Tacoma

*TRADE MARK

BEHR-MANNING • TROY, N.Y.
(DIVISION OF NORTON COMPANY)
Reliable Coated Abrasives Since 1872

POWER FEED For Facing

BORING, TURNING, FACING, UNDERCUTTING COMBINED IN ONE TOOL HEAD

The power feed feature for facing operations insures smooth, uniform movement of tool across work surface. This power feed can be engaged or disengaged instantly. Adjustment of tool for boring is obtained in increments of 1/10,000 in direct reading.

All Operations In One Set-Up

Patent Pending

For Jig Borer, Drill Press, Milling Machine

Cutting bar can be set to any position in Tee slot of slide. Hardened and ground throughout. Feed screw and worm ground from solid. Gears and feed nut phosphor bronze. Head 3" dia. x 4" long. Wt. 9 lb. Any type shank furnished. Write for complete information.

CHANDLER TOOL CO.
514 OHIO AVE., MUNCIE, IND.

CHANDLER DUPLEX
BORING AND FACING TOOL HEAD

DOUBLE INDEXING FIXTURE

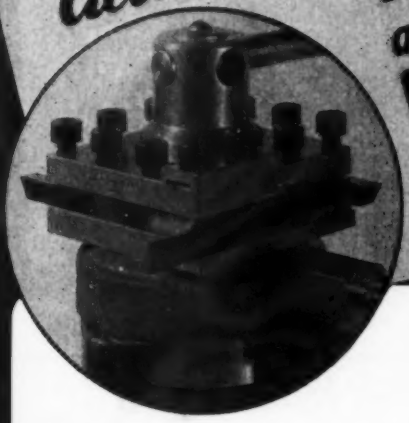
A double indexing fixture which facilitates machining close-tolerance holes at specified intervals about the circumference of a small, round aluminum housing has been devised at the General Electric Company's Schenectady Works. The housing is composed of an upper and lower section and when the holes, each 0.503" in diameter, are machined, one-half of each hole appears in both sections.

Formerly, this operation included spot drilling and reaming in a drill jig. The jig was clamped centrally with the spindle and each hole indexed in turn. The specified smooth finish was difficult to produce, the fixture was hard to keep clean, and the jig had a high maintenance factor, having been rebuilt five times. Moreover, for best results in assembly, experienced operators and assemblers were required to remove the burr caused by reaming.

The new fixture, designed for use on a double head Borematic machine, has solved the problem. Special twin boring bars, with drill tips inserted to pilot the boring tool, are used with the fixture, which is mounted on a channel-shaped fabrication of ¾" steel plate, with a bottom side longer than the top. The bottom of the plate acts as a base for holding the indexing mechanism and the shorter top serves as a mount for the work. The upper extension is supported by two posts at each end, as well as by the connecting side of the channel section.

The indexing mechanism consists of a 16-hole index plate assembled to a center-

Accurate TURNING THREADING and CUTTING OFF without new tool set-up



With a Colwell turret you can get semi-automatic operation on your engine lathe. Production is increased as there is no time lost for new tool set-ups. The operator can change from one tool to another in just a few seconds, by simply indexing the turret to the next position. Method of indexing assures accuracy, thus allowing for high precision work. The turret carries four standard square tool bits or three tool bits and a standard cutting-off tool. Cutting-off tool mounts directly in the turret and is bevelled both sides for easy clearance. Save time with a Colwell turret. Good delivery. Send for new folder.

S.G. COLWELL 25 Congress Ave., Prov., R.I.

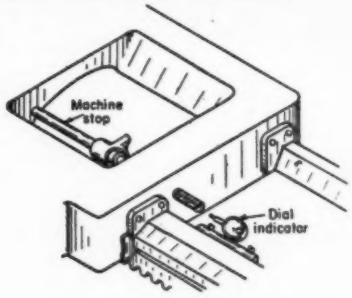
ed spur gear, at each side of which are gears of equal diameter. The center distance of the shafts, to which the other gears are attached, is within the adjustable range of the machine heads, and thus permits machining two pieces, side by side, simultaneously.

Attached to each shaft is a mounting plate with a short locating pin for each piece. The pieces are positioned over each shaft, the diameter of which permits easy loading and unloading. A large flat washer distributes the holding pressure applied by threading a four-winged nut over the end of each shaft.

Each piece is indexed by first releasing a long vertical locking pin extending from the enclosed index plate to the base plate of the fixture. This is done thru lever action of the lower attached handle. Next, the upper handle, operated horizontally, in the manner of a ratchet from the center of the mechanism, serves to position each succeeding pair of holes for machining. A pin is inserted in the first hole after drilling and boring, as a precaution against possible movement of pieces in the fixture.

This method has reduced time for this operation from 30 minutes to 4½ minutes. It also results in a reduction of assembly time because of a higher degree of accuracy, uniformity and finish of the holes.

DIAL INDICATOR ON LATHE



Dial indicator provides absolute stop

A refinement in the stop on a hand turret lathe suggested by a foreman at General Electric's Fort Wayne Works is reported to have resulted in savings per machine which are expected to amount

NEW PLASTIC-TIPPED MALLETS

NON-SPARKING — NON-MAGNETIC
FOR USE IN AIRCRAFT AND WAR INDUSTRIES

Every War plant needs SOUTHWEST Plastic-Tipped Mallets. They can be used for sheet metal work, radio, electrical work, caulking, lamination, upholstery, and assembly work of all kinds. They can also be used on metal and plated surfaces without any damage to the material. Extra tips are immediately replaceable by hand because they are threaded.

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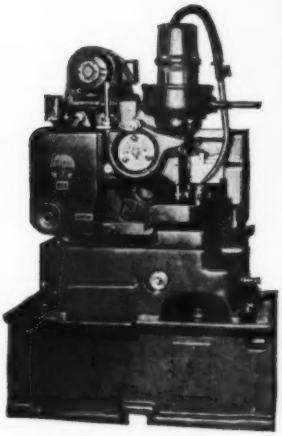
SOUTHWEST MFG. CO.
1615 EAST FIRST ST. - Dept. B-1 SANTA ANA, CALIF.
P. O. BOX 776

"We do boring, disking, profiling and generating on the Gear Shaper . . . on a variety of parts and materials ranging from $\frac{1}{8}$" to 6" or 7" in diameter"



The speaker went on to say, "In one case we do a profiling job on a stainless steel part that formerly took us four times as long on another type machine". . . Add to high accuracy and high production, the advantages of versatility and comparatively low cost of tooling—and you have over-all economy, which makes the Gear Shaper a basic tool for a wide range of work . . . Write for a copy of our catalogue, "The Fellows Method".

★ With a 7-type Gear Shaper (illustrated) capacity runs to 7 inches pitch diameter.

THE **FELLOWS** GEAR SHAPER COMPANY

78 River St., Springfield, Vermont — 640 West Town Office Building, Chicago, Illinois — 616 Fisher Building, Detroit, Mich.

TYPE A—STEP JAW DESIGN

Especially adapted for holding work with short bores while being machined between centers on lathes, grinders, millers, shapers, etc.

No.	Range of Bores Taken	Net Price
1A	½" to 1"	$12.00
2A	1" to 1½"	16.00
3A	1½" to 2"	23.00
4A	2" to 3"	34.00
5A	3" to 4"	40.00

Tremendous Advantages and Enormous Savings Are Available to Shops Using Modern, Versatile

NICHOLSON

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MANDRELS

W. H. NICHOLSON & CO.
117 Oregon St., Wilkes-Barre, Pa.

TYPE B—STRAIGHT JAW DESIGN

Adapted for work with both short and long bores.

No.	Range of Bores Taken	Net Price
1x	½" to 9/16"	$10.00
2x	9/16" to 21/32"	11.00
3x	21/32" to ¾"	12.00
00	¾" to ⅞"	14.00
0	⅞" to 1"	16.00
1	1" to 1¼"	18.00
2	1¼" to 1-9/16"	21.00
3	1-9/16" to 2"	29.00
4	2" to 2½"	40.00

(Other Sizes Taking Up to 7" Bores)

Hardened tool steel, accurately ground. Sold singly or in sets. Prompt delivery. Write for bulletin No. 1043.

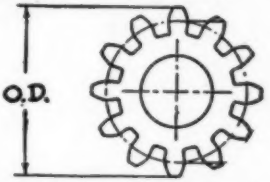
annually to 225 machine hours, 225 man hours, and 1000 lbs of material thru reduction of spoiled work.

Previously, because the "touch" of different operators varied, the regular machine stop would have to be reset by trial and error to suit each operator before good pieces could be obtained. Foreman Norman Bender suggested that a dial indicator be added to the carriage of the lathe so that the operator could run the carriage to the correct setting, adjust the stop, and set the dial indicator to zero. With the aid of Bernard Kramer, a machine operator in the shop, the idea was applied as shown. The method provides an absolute stop to close limits for all operators regardless of differences in touch.

DETERMINING DIAMETRAL PITCH

By RONALD EYRICH

When duplicating a worn or broken gear, it is necessary to determine the diametral pitch in order to select the proper cutter for the teeth. Due to the present shortage of gear pitch gages, one is not always readily available.



This simple method can be used to find the diametral pitch (D. P.) when a gear gage is not at hand,—

Count the number of teeth on the gear, add 2, and divide the total by the outside diameter of the gear. Or expressed as a formula—

$$\text{D. P.} = \frac{\text{no. teeth} + 2}{\text{O. D.}}$$

The result should be a whole number like 3, 4, 6 or 10. The outside diameter of the gear might be worn, in which case the result of this calculation may be a number like 8.010. It can readily be assumed that the D. P. in this case would be 8.

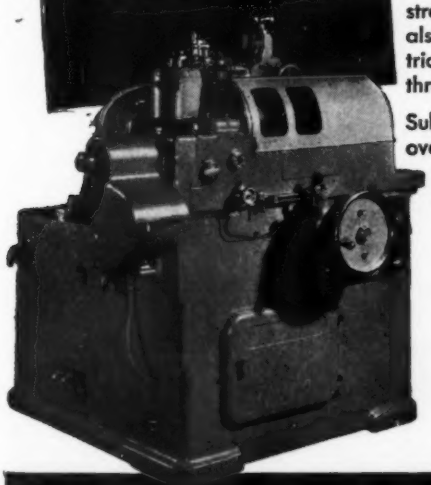
This method holds true for gears and pinions of the spur or helical type.

SUGGESTION TRIPLES OUTPUT

With the shortage of process and tool engineers available to industry, Delco Products in Dayton launched a campaign

New

THREAD-GRINDING ECONOMY ON COMMERCIAL PRODUCTION



Greatly increased production of thread grinding which produces a far more accurate and precise thread of superior finish than possible with other methods, may be achieved with Sheffield Precision Thread Grinders. These are the first American designed machines on which either the multi-ribbed or single-ribbed wheel may be used.

The finished thread may be formed in one pass by "plunge cutting" with the multi-ribbed wheel—high production of high quality. Multiple threads are ground in one pass without necessity for precision indexing.

Fine threads can be ground AFTER hardening, especially on thin-walled components, eliminating objectionable stresses and possibility of distortion—also assures thread being held concentric with other ground diameters and threaded sections of work part.

Substantial savings in operating time over conventional machines make it more economical to grind threads with a Sheffield Thread Grinder. Also because of these savings, it is now feasible to grind threads formerly produced by other methods.

Write For Full Details
Bulletin M-100-143

SHEFFIELD MASTER CRAFTSMEN

THE SHEFFIELD CORPORATION

Dayton 1, Ohio, U.S.A.

MACHINE TOOLS — GAGES — MEASURING INSTRUMENTS — CONTRACT SERVICES

among its operators to teach them to be their own process engineers as far as possible. To reward workers with good process improvement recommendations, regular WPB-type suggestion awards were set up. The campaign uncovered numerous individual places where quality or production could be increased by simple change. For instance, Martin House, who operates a Fay lathe in Department 17 netted himself a cool $317.92 by a simple suggestion.

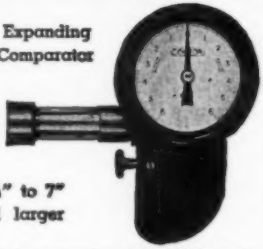
House had the job of turning alloy steel tubes for bomber struts on his Fay, equipped with four H. S. S. tools. He was getting about 2½ pieces per hour. He had the idea that if he could use tools tipped with Carboloy cemented carbide he could boost his own contribution to the war effort.

House turned in a suggestion that Carboloy tools be tried. They were. Spindle speed was jumped from 26 to 130 rpm while feed and depth of cut remained unchanged. So House is now getting three times the number of strut tubes off his lathe and has $317.92 to prove his suggestion was appreciated.

GAGING TO FRACTIONS OF .0001" BY RELATIVELY UNSKILLED WORKERS

COMTORPLUG

Patented Expanding Internal Comparator



Sizes: ¼" to 7" dia. and larger

"Makes trainees master gagers." By automatic features of self-centering and self-alignment, this unique comparator gages precision bores to fractions of .0001", detecting out-of-round, front or back taper, bell mouth, barrel shape, etc. Widely used in airplane, automotive and ordnance fields.

REQUEST BULLETIN 29

THE COMTOR CO.

63 Rumford Ave. Waltham, Mass.

LESLIE HAND PUNCH PRESS

MOST CAPACITY

POSITIVE ALIGNMENT

Max. Cap. 2" dia. hole thru 10 ga. iron, proper shear on punch, throat depth 6". Takes punch press dies up to 3"x4½" in area. Leaf arm gives perfect alignment without ways or leader pins.

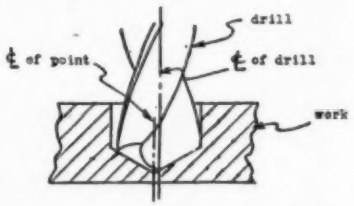
Portable. Used very successfully for "quick process" dies. *Write for information.*

LESLIE WELDING CO.

2947 Carroll Ave. Chicago

DRILLING LARGER HOLES

By RONALD EYRICH



Sometimes it is desired to drill a hole just a little larger than the drill. This can be accomplished by grinding the point of the drill so that ane cutting edge is slightly longer than the other. In other words it is ground so that the point is off center as shown in the exaggerated sketch. The amount to offset the point depends on how much larger than the drill the hole is to be.

CONCENTRIC ALIGNMENT GAGE

A concentric alignment gage devised at General Electric's Schenectady Works quickly centralizes the outer rim of circular pieces for subsequent boring operations. Previously, the alignment check had to be made by securing a bar in the machine spindle and then revolving the spindle.

The gage is clamped to the machine spindle by means of a hinged collar and screw, and a metal scriber is positioned in the mounting block at the end of the offset arm. (An indicator could be attached if desired for this or other possible applications.) The gage is designed to be used in either of two ways:—The spindle gear can be disengaged and the spindle, with the gage tightly clamped to it, rotated by hand or by the "jog" method to check concentricity of the skirt. Or, if

How Prominent War Industry Increased Tapping Production Over 600%

CASE HISTORY No. 3

The third of a series of actual case histories showing how war industries boost their production and save critical tools and materials, with Bakewell Precision Tapping Machines . . . . . .

FIRM: A Who's Who Name Among Automobile Manufacturers*
TAPPING MACHINE: Bakewell Radial No. 1-R
PIECE TAPPED: Reduction Gear Case
MATERIAL: Aluminum
SIZE OF TAP: 5/16-18
NO. HOLES TAPPED PER HOUR: See Remarks
PERCENTAGE OF REJECTS BEFORE USING BAKEWELL: 6
PERCENTAGE OF REJECTS WITH BAKEWELL: 2

REMARKS: When the job was first set up, we tapped the holes by hand, but later changed to a--------tapping machine. We now tap these 5/16-18 holes on the Bakewell with the following results: the Bakewell is 6 times as fast as the hand method and 30% to 100% faster than the first machine used. It may also be noted that with the Bakewell no bushing is required to guide the tap. A special indexing feature is used. The cutting oil is Socony Vacuum's Thread Grinding Oil #269. In sizes up to 3/8" 2-fluted taps operate most efficiently.

BAKEWELL
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preferred, the spindle may be kept in gear and the gage clamping screw adjusted so that the collar or entire gage rotates about the spindle.

This gage can be kept constantly on the spindle and always in readiness for final positioning.

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● Three grades of diamonds. Common quality $12 per karat. Medium quality $24 per karat. Select quality $48 per karat. (Contour template diamonds supplied only in Medium and Select quality.)

All diamond sizes ¼ to 10 karat are nib mounted for immediate shipment . . . Billed subject to approval. Specify quality of diamond wanted. We recommend a minimum size of one karat for each 6" diameter of grinding wheel. (24 hour resetting service, $1.00 post paid.)

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BAND BRAKE LOCKING DEVICE

When the locking device originally built into the rotary table of a large drilling, boring, and milling machine at General Electric's Schenectady Works became worn and would no longer hold, a pneumatic brake with remote control was devised by Samuel Griffiths, a machinist.

The brake consists of a leather-lined metal band placed around the base of the revolving table. One end is bolted to the frame beneath the table, while the movable end is attached to the same frame thru a lever. An air cylinder with its plunger pressing against this lever furnishes the necessary movement to actuate the brake.

The air lines are run to a three-way air valve at the control station on the machine. Thus, the operator may make all necessary adjustments for revolving and locking the table and starting the drill from one point. Reversing the flow of air retracts the plunger and releases the brake.

The simplicity of Mr. Griffith's idea makes it readily adaptable for similar applications. Most of the parts used for the brake were salvaged from scrapped machines.

SILVER SOLDER DISPENSER

This easy-to-make dispenser, suggested by John Antkowick, a workman at General Electric's Schenectady Works, simplifies the feeding of ribbon-type solder in silver-alloy brazing work and prevents waste. The dispenser is a flat metal case

SPEED

1

SPIN THE HANDWHEEL and the ram speeds to the work by fast mechanical action instead of slow, laborious hydraulic pumping.

2

FLIP THE BALL ARM to close the valve instead of slowly turning a handwheel type control.

3

START PUMPING and immediately get tons of pressure on the work because the hydraulic cylinder was automatically filled with oil during oper. No. 1.

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SPEED is the basic design feature of KRW Hydraulic Arbor Presses—*they are faster than most power-operated presses.* In operation, you get *speed* in bringing the ram to the work ... *speed* in developing hydraulic pressure ... *speed* in raising the ram to remove the work. These KRW features have sold thousands of our hydraulic presses to industry where they are doing work formerly considered only possible on larger, heavier and more costly equipment. Ingenious adaptations of KRW presses have been built to handle many kinds, sizes and types of material. All, of course, incorporate the KRW principle of SPEED in operation. Write for our new bulletin describing KRW Hydraulic Presses in 25, 50, 60 and 75-ton capacities.

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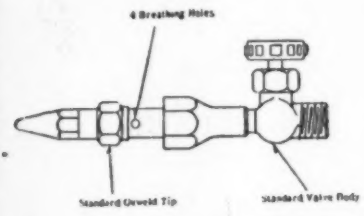
containing two rollers, one in the circular portion and another near the point. The silver solder is thumb-fed over the second roller and out the point of the dispenser thru a slot in the edge of the case. Previously, the operator would cut a piece of solder about two feet long. As this strip became shorter it would get too hot to handle and the workman would drop it and get another piece. The dispenser can be loaded quickly with sufficient solder for a large number of brazes, and permits the operator to keep his hand far enough from the work to avoid being burned.

LOW HEAT SOLDERING



The accompanying sketch shows construction of a special welding head when used with hydrogen for soldering operations. Acetylene can be used for a hotter flame by increasing length of the injector head and decreasing diameter of the hole in the injector head. This special head was developed for use in the East Pittsburgh Works of Westinghouse. When used with hydrogen, this tip gives a flame temperature of approximately 2000° F. When acetylene is used, the flame temperature is approximately 3500° F. Thus the head can be used for soldering operations requiring use of lower melting solders and permits use of a gas flame on materials that would be injured by the 6300° F. flame temperature of an oxy-acetylene flame.

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Priority Regulations govern delivery.

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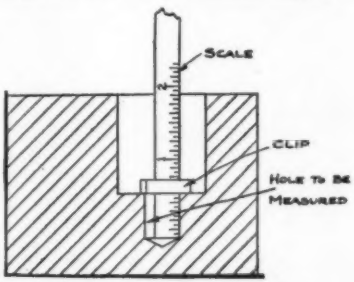
IMPROVISED DEPTH GAGE

By RONALD EYRICH

The depth of a hole or slot can be measured easily with this improvised depth gage. Slip a flat paper clip over an ordinary machinist's scale. The clip will serve as an indicator for making blind measurements, and also serves well for use where it is desired to compare the length of two or more similar objects.



SUBSTITUTING LEAD-COATED STEEL

That use of "alternate" materials does not necessarily mean impairment of quality is shown by the way in which lead-coated steel is doing a better job than did copper or brass in the manufacture of a small part for electric motors. Such steel was adopted by engineers of the Fort Wayne Works of General Electric Co., to conserve critical metals previously used for making banding rings. Rotors of certain types of motors were previously equipped with such banding rings of either copper or brass, solely so that the rotors could be dynamically balanced by applying drops of solder to the bands as required. Solder would adhere easily and tightly to either of these metals.

Solder likewise clings tightly to lead, so by changing to bands made of lead-coated steel, several thousand pounds of copper and brass have been conserved. In addition, because of the greater tensile strength of the steel, weight of the bands has been reduced by nearly 60 per cent since a thinner band can be used. Still another advantage resulted since the thinner steel bands leave a greater radial space available for the balancing solder.

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HANDWHEEL SPEEDICHUK

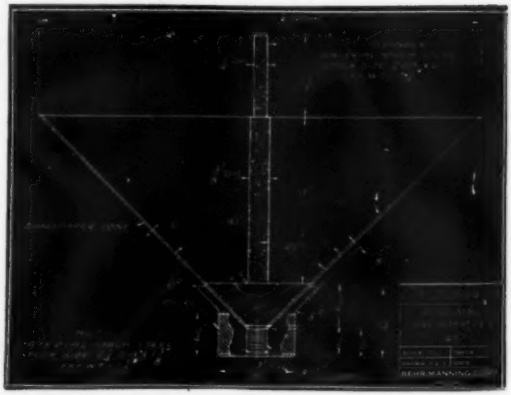
List Price $19.75, Collet extra — For use where quantity production is not required. Lathe must be stopped to open and close collet.

GENERAL DIE-STAMPING-TOOL COMPANY

PRECISION COLLET DIVISION 265 Canal Street, New York 13, N.Y.

LIGHTENING HOLE DEBURRING

A major deburring problem in the aircraft industry has been burr removal and generating of radii on I. D. of lightening holes. These holes are generally cut or stamped in the Dural stringers and bulkheads, used as supporting elements. They range from 2" diameter to 7" diameter and are cut out circular and elliptical in shape for the sole purpose, as their name implies, of lightening the planes.



In every instance, the rough, uneven surfaces left by router or stamping machine must be smoothed out and a slight radius produced around edges of hole before the piece may become part of an airplane. This operation has been performed by various hand methods utilizing coated abrasives in some plants and hand scrapers in others. In general, all methods in use have been rather unsatisfactory and the field is open for introduction of a more satisfactory method.

Such a method has been devised by Messrs. Russ Mannette and Walter Trezise, working in conjunction with the Product Engineering Dept., of the Behr-Manning Corp., Troy, N. Y. After considerable testing, this new method has met with approval of at least two of the larger plane manufacturers in the East.

A special shaped, unjointed Lightning Metalite Cloth cone mounted on a special cone adapter is utilized, designed for specific use as a lightening hole deburrer. It should be noted that these have been designed with a 45° angle, this being the correct angle, determined after considerable experimenting with cones and various angles.

Altho several methods of mounting the deburring tool are possible, its most efficient use appears to be when mounted on the shaft of a standard 1800 rpm motor of 1/3 to ½ hp, depending on the size hole and gauge of stock being deburred. Motor may be attached to bench with shaft at right angles to front edge so cone will overhang, allowing operator to bring the sheet to the cone. Optional mountings on drill presses, etc. are of course possible, provided cone is not operated in excess of 2000 rpm. Speeds greater than this cause cone to flare to a degree that makes its use impractical.

A standard three jaw cnuck or a special adapter would, of course, be required to

Type RK

Alnor

PYROMETERS

This Alnor Pyrometer is a two-circuit surface mounting type designed for simple conduit wiring at back or base of the case. This instrument is ruggedly constructed and designed for consistantly accurate performance.

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Quick Delivery OF QUALITY CUTTING TOOLS

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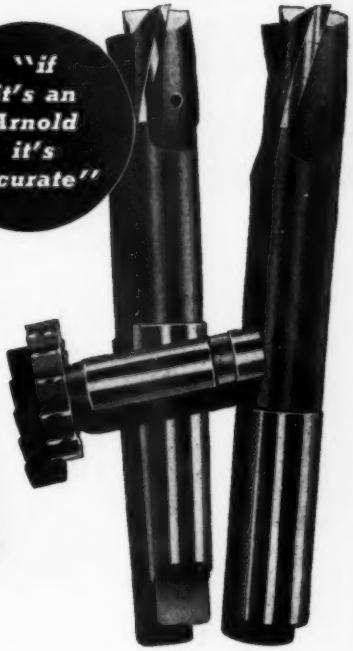

Many of America's leading manufacturers have learned that most of the quality cutting tools listed in the new Arnold catalog can reach them surprisingly fast. For instance, three types on which you can expect almost immediate delivery are illustrated above. They are: counterbores, straight and taper shank with interchangeable pilots and Woodruff key seat cutters. Arnold's thirty years of toolmaking experience can provide you with cutting tools that can be depended upon for maximum efficiency, service and accuracy. If you do not have our new 40 page catalog containing the complete Arnold line, send for it at once. No obligation.

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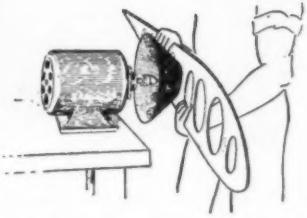
hold cone adapter if used in conjunction with a bench mounted motor.

The cloth, cut to conform to the special shape can be quickly assembled as a cone on the adapter. In general, grit No. 80 Lightning Metalite Cloth cones are used to deburr holes cut with routers, this usually being the heavier gauge Duralumin. Lighter gauge stock is stamped out as a rule, and grit No. 120 Lightning Metalite Cloth cones have been found more acceptable.



Altho these cones may be applied to the adapter unjoined and lapped over, best results have been obtained by clipping the cone together at the ½" overlap with an ordinary paper stapler.

In actual operation, the Dural stringer or bulkhead lightening holes are sanded to a fine, rounded edge, by forcing hole over the revolving cone to a point where cone is slightly larger in diameter than hole being sanded. The pressure thus exerted on cone causes it to conform to the hole, removing the burr and producing a radius on the hole. As diameter of the cone varies from 2" at top to 8" at base, practically any size hole from slightly over 2" to 7" may be deburred on this standard size 45° angle cone.

**STAY ON THE JOB—
UNTIL IT'S OVER—
OVER THERE!**

TAPPING 24 Hours a Day
. . . 6 days a week!

. . . and producing accurate work. That is a report from one plant where four Procunier Tapping Heads have been operating continuously for over a year. Thousands of shops report similar experiences because these remarkable heads are built to stand under the toughest production grind. The exclusive advanced design of the new Procunier Tapping Heads assures you accurate tapping at high speeds with automatic protection for taps! Tap is driven by a double-cone, cork-faced friction clutch which automatically regulates tap driving power by pressure applied through the drill press spindle. Operators can quickly detect full or loaded taps by the "feel," or pressure on the clutch, required to drive them thus avoiding needless tap breakage. With this sensitive Procunier smooth operating friction clutch, bottom tapping is as simple as through tapping, since the clutch instantly slips should the tap strike bottom or stick due to tap loading.

Cross section of Tru-Grip Tap Holder showing positive drive to tap.

EXTERNAL THREADING

Standard Procunier Tapping Heads can be equipped for external threading. Produce accurate work and increase output.

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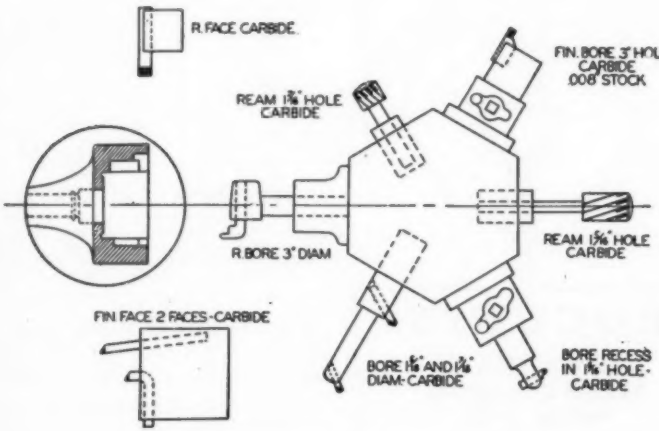
CARBIDE TOOLING PRODUCES "GROUND" TOLERANCES AND FINISH

By Carl Blade, Carboloy Co., Inc.

AN ingenious tooling method, resulting in holding the dimensions of machined surfaces in aircraft parts to tolerances within a few ten thousandths in relation to each other, while obtaining surface finishes of a degree of smoothness equivalent to that obtained by grinding has been developed by Yale & Towne Mfg. Co., Stamford, Conn.

The part on which the process was first worked out was a body for a 3" I D vacuum fuel pump in which a high dry vacuum had to be maintained (See Fig. 1). This necessitated extremely close tolerances since even a very small increase in running tolerance materially reduces the necessary vacuum. Total running clearance actually must be held to 0.0010" maximum with the rotor running at 1750 rpm.

To produce the fine finish and close tolerances required, the entire sequence of boring and facing operations is carried out on a turret lathe employing mainly, cemented carbide tools. The tooling layout employed is shown in Fig. 2. The first operation—rough boring the 3" diameter is performed with a non-carbide tool. Next, the 1-5/16 and 1-7/16" diameters are bored with two carbide tools mounted on the same quill, to assure that these bores will be concentric within a few tenths, maximum.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FIN BORE 3" HOLE CARBIDE .008" STOCK
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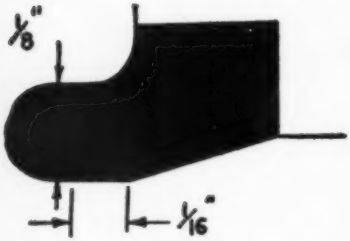
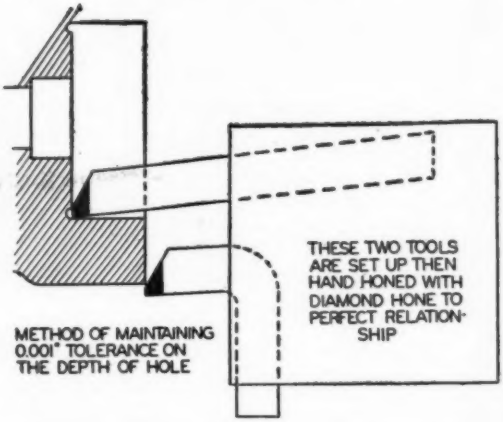
ENLARGED CUT OF POINT OF FINISH BORING TOOL



FLAT IN CONTACT

A recess required in the 1-5/16" bore is next produced with a carbide tool, followed by reaming the same bore with a carbide reamer. The 3" diameter is then finish bored to within a few tenths of concentricity (and as to size) with the 1-5/16" bore. In this operation, it was found impossible to obtain the close tolerances by reaming, due to the unequally cored parts. The carbide tool now used, cuts at around 200 rpm., equivalent to around 160 s.f.p.m. Feed is 0.012" with a stock removal of around 0.008" per side. The tool developed for this operation is shown in detail in Fig. 3. Note the flat contact surface on the 1/8" nose of the tool. Final operation with the turret tools is the "carbide reaming" of the 1-7/16" hole, concentrically with the other diameters.

With one exception, the various illustrations appear in the order in which they are mentioned. Figures 1 and 2 are on the preceding pages. Fig. 3 is at the top of this page and Fig. 5 appears at the right. Fig. 4 appears on the following page.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METHOD OF MAINTAINING 0.001" TOLERANCE ON THE DEPTH OF HOLE

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Automatically compensates for Machine Spindle Mis-Alignment

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Reduces Tool Costs **Reduces Scrap**
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Much setup time is wasted and many parts scrapped trying to produce uniform, accurately tapped and reamed holes on machines with spindles out of alignment with the work. Many die head chasers and taps are condemned for this reason. Many holes are reamed bell-mouthed or oversize. An F & H Manufacturing Co. Floating Tool Holder will eliminate these troubles—try one on your most difficult job. Write TODAY for full details.

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The Peerless Standard is made in three sizes: 6 x 6 in.; 9 x 9 in.; 13 x 16 in. Belt or motor drive. One or three speeds. All have automatic feed to compensate for hard spots—positive clearance on return stroke—gauges to limit height of saw-frame lift on return stroke. Mail the coupon — *now!*

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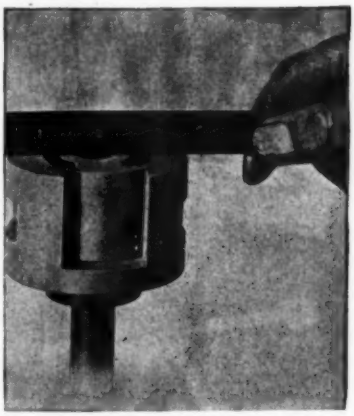
Fast ACCURATE *Sawing* DEMANDS PEERLESS BLADE CONTROL

Due to operating requirements, depth of the 3" bore must also be held to within a few thousandths in relation to the face of the pump body (see Fig. 4). To achieve this, the face is first rough faced with a carbide tool mounted on the rear slide, while the tools for finish facing both faces simultaneously are mounted on the front slide.

The close relationship of the faces is obtained by mounting these two tools (see Fig. 5) in the front tool slide and then hand honing them with a diamond hone to perfect relationship.

The process has been so consistently successful that Yale & Towne has since applied the same principles to the machining of other precision parts. Contributing to the successful operation, of course, is that the long life of the carbide tools between grinds maintains the correct relationship over long periods.

On some iron and bronze parts on which tolerances of only 0.0002 to 0.0003" must be held, Yale & Towne is currently machining with carbide tools at speeds as high as 1300 ft/min and 2500 ft/min respectively.



Six men were formerly required to "finish" some of these parts by filing. Typical is the rotor shown in (Fig. 6), the inner faces of which are finished with the fly-cutter shown, this cutter, carrying two standard cemented carbide tools Depth of cut is 0.007 to 0.010" per side with a table travel of 8¾" per minute.

One result of the application of carbide tools to such machining operations at Yale & Towne has been the ability to produce completely interchangeable parts without the necessity of "matching" rotors and pump bodies in sets—a highly important development in view of service requirements in the field.

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10 YEARS EXPERIENCE

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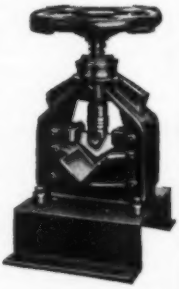

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Operates 6 quickly interchangeable attachments for Grinding, Wire Brushing, Disc Sanding, Polishing, Buffing and Drilling.

Easily wheeled over smooth or rough flooring right up to the work, saving material handling.

Plugs into any regular electrical outlet and operates independently of all other tools.

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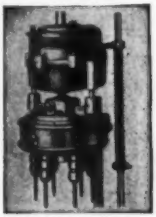
IT'S Ettco-Emrick FOR
HIGH-PRODUCTION DRILLING AND TAPPING EQUIPMENT

⬅ TAPPING ATTACHMENTS

Make a high-speed, sensitive tapper of any drill press. Quickly mounted without altering press. 7 sizes, for No. 0 to 1" taps. QUILL CLAMPS available to assure absolute rigidity. For full details, write for **Bulletin No. 2.**

MULTIPLE DRILLING AND TAPPING HEADS ➡



Highest production system for drilling and tapping. Makes it possible to drill or tap maximum number of holes simultaneously. Heads made entirely of standard parts. Can be used on drill press or tapping machine. QUILL CLAMP furnished with every head. For full details, write for **Bulletin No. 3.**

⬅ VISIBLE GRIP TAP CHUCKS

True centering on round and positive driving on square assured because operator can see grip when inserting tap. 5 sizes for No. 0 to 1" taps. Details in **Bulletin No. 6.** Collet type tap chucks available for No. 6 to 3/8" taps.

FAST TAPPING MACHINE ➡

Has hair-trigger sensitive central friction clutch, automatic reverse and sensitively counterbalanced foot pedal. All the operator has to do is feed the work and step on the pedal. Unskilled operators can maintain production rates up to 12,000 holes per hour. For full details, write for **Bulletin No. 4.**

⬅ KEYLESS DRILL CHUCKS

Speed up drilling and save energy by eliminating the non-productive key-tightening operation. Also end slipping and re-tightening. Highest quality precision construction. Good for long, hard service. 5 sizes for No. 0 to 5/8" drills. Also stocked for portable drills. For full details, write for **Bulletin No. 6.**

ETTCO TOOL CO. 596 Johnson Ave., Brooklyn 6, N. Y.
Detroit • *Chicago*

Atlas COOLANT PUMPS

FOR ALL TYPES of MACHINE TOOLS
NEW LOW PRICES
$23.75 and up

Now you can equip every machine tool for higher production with a compact, portable, low cost Atlas Coolant Pump — Screw machines, lathes, drill presses, milling machines, cut-off tools, saws. Cuts tool wear, cuts rejections for poor finish, lets the operator concentrate full time on production. Powerful centrifugal type pump handles any cutting field—permits adjustment from drip to stream. Atlas Coolant Pumps come in two models with universal or induction motor, handling 450 and 225 GPH. Feed lines of durable, tough extruded plastic. Ask your Atlas distributor for full details or write us. Atlas Coolant Pumps are ready for immediate delivery.

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LATHES • DRILL PRESSES • ARBOR PRESSES • SHAPERS • MILLING MACHINES

WHAT'S NEW IN METALWORKING

HANCHETT No. 24 SURFACE GRINDER

A NEW No. 24 Vertical Spindle Rotary Surface Grinder, recently has been added to the line of large surface grinders made by Hanchett Mfg. Co., Big Rapids, Mich.

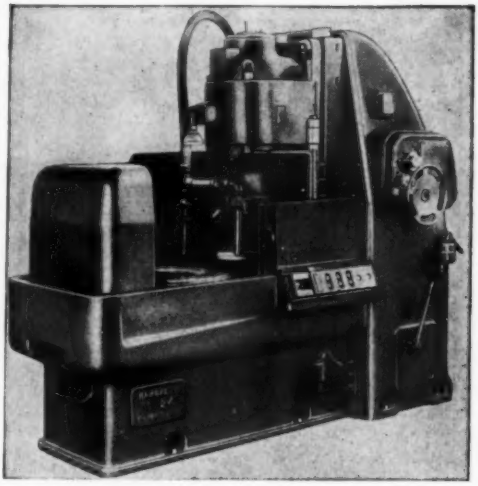
The Grinder's structural proportions are especially heavy and strong to insure precision and long service.

The 30" rotary magnetic chuck is equipped with a built-in Neu-T-Rol demagnetizing switch to facilitate removal of work from the chuck and at the same time demagnetize it. The chuck is traversed into grinding position by push-button control.

The grinding wheel head has hand, power or automatic traverse with power being furnished by a two hp 900 rpm motor.

The motor driven wet grinding system includes a coolant pump driven by a ½ hp motor.

The No. 24 is equipped with a rugged swing arm wheel dresser, ammeter for determining the cutting action of grinding wheel, flood light and other accessories which aid in grinding to close tolerances.



VERSON TRANSFER FEED PRESS

This Verson Full Eccentric Transfer Feed Press, designed and manufactured by the Verson Allsteel Press Co., 9303 S. Kenwood Ave., Chicago, 19, may be the post-war answer to many of the production problems of parts manufacturers and producers of such items as coaster wagons, cooking utensils, stove sections, and other commodities of reasonably regular shape.

The press is equipped with nine time stations. It can blank, draw, redraw, pierce, size, and emboss 720 filters per hour, untouched by human hand. This huge machine has a capacity of 500 tons and is 138" between the housings. All working stations are interchangeable and individually adjustable.

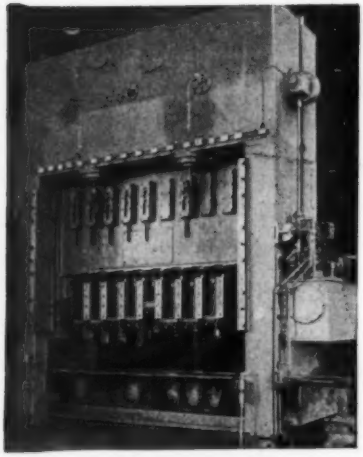
Two points of force application insure an even distribution of pressure across entire slide area. Slide and frame are of characteristic Verson welded construction, which the makers say offers maximum resistance to torsional twist and deflection, insuring accuracy and long punch and die life.

PRECISION TOOL ROOM AND PRODUCTION LATHES

BEST known as quality tool room lathes, SHELDON Precision Lathes are also ideally suited for much second operation and other production work because of their extra collet capacity, sturdy construction, accuracy and available production features, including: Lever operated Bed Turret, or Tool Post Turrets, Lever operated Collet Attachments, Tailstocks, Double Tool Posts, 4-speed underneath motor drives, etc. If you are looking for a 10", 11" or 12" Precision Lathe for the Tool Room or Production Line, be sure to see the SHELDON Lathe before you order.

SHELDON MACHINE COMPANY, INC.

4242 N. Knox Ave. **CHICAGO 41, U. S. A.**



Full eccentric construction is said to provide maximum factor against shaft failure; there is no crankshaft to bend or break. Split cap design bronze-bushed main bearings permit easy renewal and quick adjustment. An extra long "full-thrust" eccentric strap reduces friction between gibs and slide. Barrel type adjusting screws, equipped with buttress threads, remain vertical at all positions of the stroke, virtually eliminating bending moment.

The press is available in a broad range of sizes and tonnage capacities.

LIGHT DUTY TAPPING MACHINE

A new series of light duty lead screw type tapping machines is announced by Detroit Tap & Tool Co., 8432 Butler Ave., Detroit, 11, Mich. Designed for precision tapping in production, new series LTM machines are rated, as to capacity, up to a maximum of ⅞" diameter and 14 pitch in mild steel.

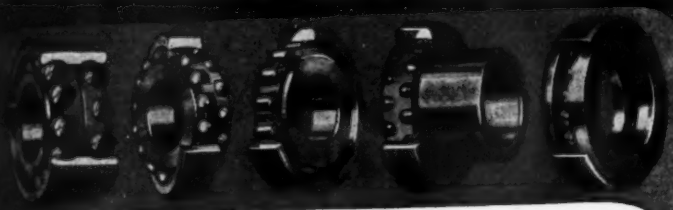
Increased accuracy is claimed for the new machines. Sturdy guide rods control tapping spindle thruout entire length of stroke. Moveable head, in turn, guides driving end of tapping spindle. Further assurance of accuracy, especially on deep holes, is obtained by driving tapping spindle at a point between tap and lead screw itself, eliminating necessity of having lead screw drive the tap.

Lead screw and bronze lead nut are of interchangeable type and may be removed as a unit by removing dust cap and one screw. Lead screw is of high speed steel, hardened and ground all over, including threads. The two-piece bronze lead nut can be adjusted easily to take up wear and remove backlash.

Tapping head and motor may be raised and lowered by a rack and pinion operated thru worm gearing to accommodate work of varying heights and may also be adjusted horizontally thru an arc of approximately 90°, making it possible to tap at different positions on table or fixture. Multiple tapping heads can be applied. The standard table is square and provided with T-slots. A rotary indexing type work table, 15" in diameter is now also available at a slight additional cost. Pedal-control is provided for easy locating of work. Emergency stop and reverse push buttons are provided.

Standard spindle speeds are 64,, 160 and 400 rpm. Pulleys for other combinations can be supplied. Motor is adjustably mounted. Drive is equipped with a friction clutch of multiple disc type which may be set by hand for any desired degree of operating tension.

Tapping cycle is controlled by limit switches. Trip dogs which contact limit switches are adjustable to any desired length of tapping stroke in the machine's limits. A push button starts machine. Spindle travels to bottom of stroke, automatically reverses, then stops at top.



CJB AHLBERG

Ball AND Roller BEARINGS

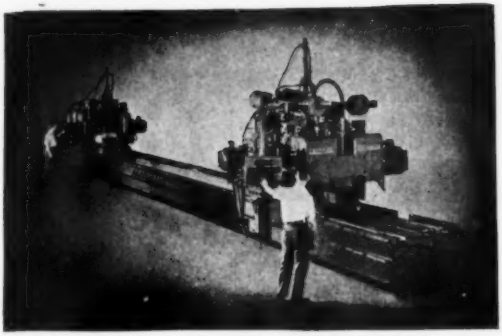
There are standard (CJB) Ahlberg Ball Bearings and Bower Roller Bearings for most applications. Whether you are building new equipment or modernizing present equipment, (CJB) AHLBERG Ball Bearings and BOWER Tapered Roller Bearings will do the job efficiently, economically and satisfactorily.

AHLBERG BEARING COMPANY

★ 3009 WEST 47th STREET • CHICAGO, ILL. ★

FARNHAM BUILDS GIANT SPAR MILLER

THE Farnham Mfg., Co., builders of many special machines for the aircraft industry, announces delivery of what is said to be the world's largest spar miller.



The new machine is similar in principle to other Farnham high speed spar millers already on the production lines, fabricating spars for most of America's top military aircraft. Over-all length of machine is listed as 91′ with a table length of 80′. Two carriages, having a total of six milling spindles, travel the length of the bed during the milling operation. The two carriages operate independently of each other. They are used simultaneously when milling long spars, performing as many as six operations at a time, or independently on short spars. Horse power for the spindles ranges in three figures. The machine was designed for Farnham by Paragon Research, Inc.

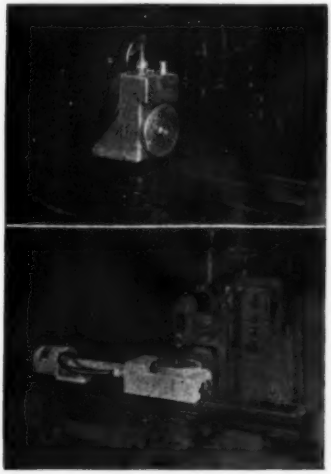
AUTOMATIC INDEX BASES

New Automatic Index Bases have been designed in 8 and 12″ size diameter tables for mounting in horizontal and vertical positions. Index with 8″ diameter base is used as an attachment on the No. 00 and 0 Hydraulic Rigidmils. Index with the 12″ diameter base is used with No. 1 Hydraulic Rigidmil and No. 2 Electromil.

These bases provide many possibilities for reducing milling costs. Extra handling in repositioning parts for multiple cuts is eliminated and "built-in" automatic accuracy allows for continuous reproduction to close limits for long runs. This attachment is thoroly sealed against dust, chips, or oil and can be used for dry milling or for operations requiring use of a coolant. Used with A-C only, the bases can be supplied with new Sundstrand Milling Machines or attached to their machines already in the field.

Mounted in the vertical position the base can be used with a tailstock (work holding equipment and tailstock, extra) for milling splines, keyways, slots and similar operations. It can also be used in the vertical position for milling parts chucked on axis of base.

In horizontal position, the base can be used with station type indexing which makes it possible to load one part while another part is being machined (fixtures extra). Castellated nuts, hexagons and similar shaped parts can also be located on axis of base in horizontal position. Multiple cuts can be made in this manner without repositioning parts (work holding fixtures extra).



The features include complete automatic operation, precise spacing, powerful clamping and considerable latitude in selecting indexes.

NEED
STANDARD DIE SETS
OR
DIE MAKERS' SUPPLIES?
Call "DETROIT"

The wartime growth of our business is due not only to the general increase in metal-working activity but also to our genuine desire to serve the best interests of every customer, and help solve their production problems. We invite your inquiries regarding standard and special die sets, all steel and semi-steel, dowel pins, cap screws, die springs and other accessories.

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DETROIT DIE SETS ★

HAMMOND WET-N-DRY CARBIDE TOOL GRINDERS

A newly designed line of 10 and 14" carbide tool Grinders has just been announced by Hammond Machinery Builders, Inc., 1614 Douglas Ave., Kalamazoo 54, Mich.

A new coolant control feature enhances the facilities for flooding the tool while grinding wet, it is claimed. Coolant spouts are fully adjustable with wide outlets which permit correct flushing of the work by a slow, easy cascade of coolant, without force. New large splash pans around table provide adequate operator protection, do not obstruct vision, enhance operating freedom in movement of tools on table and prevent coolant splashing over.

A new safety cup disc prevents possibility of an operator accidentally dropping tools into "well of the cup wheel". The safety disc moves in with the hood and table as wheel wears.

An improved concealed, swivel no-splash guard on wheel, closes one side of cup wheel while other side is in use. It is reported to aid greatly in giving maximum visibility and providing complete freedom of motion of tool around working area of wheel. Large, generous surface ground tilting tables have replaceable wear plates between table slot and wheel.

Wheel changes are made easier, it is said, by this new design, because entire wheel guard hood is easily removable by loosening two conveniently located cap screws on either side of hood section. Water connections inside hood are of flexible hose. Thus entire hood unit may be laid on top of machine exposing wheel.

Machines are completely equipped:—10" Grinders supplied with 2 hp motor; 14" Grinders; 3 hp motor; 220 or 440 volt, 3 phase, 60 cycle, 1750 rpm, ball bearing, totally enclosed fan cooled reversing motors; magnetic reversing switch with overload and low voltage protection; compound protractor tool gage; wheel dresser holder; coolant tank and motor driven pump for wet grinding; safety cup discs; guards and pans, etc.

Back the Attack!
Buy War Bonds

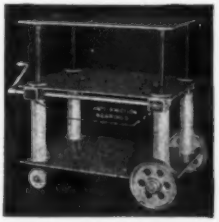
A Good Start to Save Man-Power in '44

PORTELVATOR
(Portable Elevating Table)

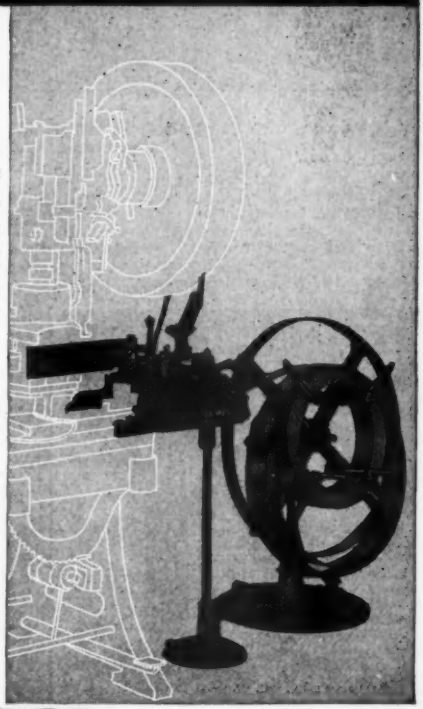
Capacity to 20 tons.

THE HAMILTON TOOL CO.
Ninth and Hanover Streets.
HAMILTON OHIO

Your willing, capable "handy man" throughout your plant. Lift, carry, use as auxiliary work bench, for overhanging jobs . . . 24 hours a day.



Our Punch Presses Are More Flexible And Productive With WITTEK *Automatic* Roll Feeds And Reel Stands



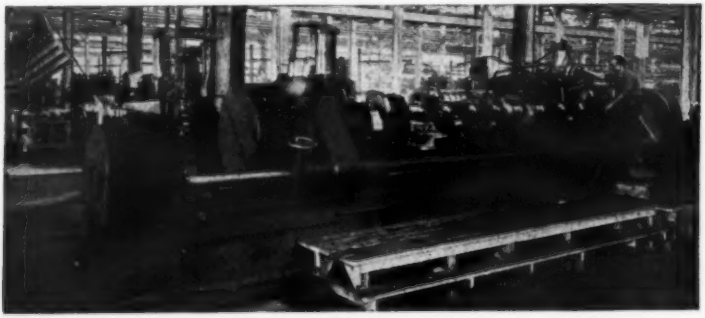
Manufacturers of metal stampings facing problems in the feeding of coiled strip stock to punch presses will find that Wittek Automatic Roll Feeds and Reel Stands conserve man-hours and achieve new high production levels.

Providing an improved and simplified method of punch press operation, Wittek Automatic Roll Feeds and Reel Stands insure rapid, safe and accurate feeding under all conditions. Made in four different types to meet all automatic feeding requirements. Write for complete details. Wittek Manufacturing Co., 4305-15 West 24th Place, Chicago, Ill.

ARMY E NAVY

WITTEK WMCo *Automatic*
ROLL FEEDS and REEL STANDS
For All Makes and Sizes of Punch Presses

HUGE DIESEL CRANKSHAFT GRINDER



A grinding machine that puts maximum precision into Diesel engine crankshafts has just been installed at The Baldwin Locomotive Works, Philadelphia, Pa. The unit, said to be the largest of its kind in the country, can handle crankshafts up to 216", and has a swing capacity of 40" It is driven by two motors, a 30 hp wheel drive motor, and a 7½ hp traverse drive motor, and will grind crankshafts for engines of from four to 12 cylinders. It was built by Landis Tool Co., Waynesboro, Pa.

The machine is one of several specially-designed pieces of equipment for the new Baldwin Diesel shop, which will cover 300,000 square feet.

Expansion is scheduled for completion this year, and will enable Baldwin to materially step up production of Diesel engines for locomotives, marine use, pipe lines, power plants and general industrial service.

The CRITERION Carbide Tool Grinder

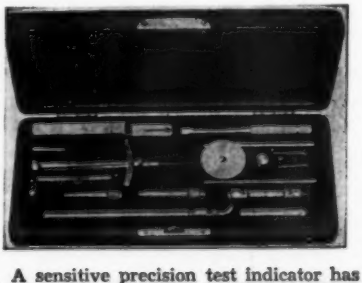
GREATER PRODUCTION CAPACITY

Provides positive rapid adjustment to meet the rigid requirements of production tool manufacturing. Built for continuous service. Adjustable coolant system. Large work tables instantly adjustable without wrenches or other tools. One-third H.P. balanced precision bearing motor completely enclosed and radially mounted in rubber. Standard equipment: One 60 and one 100 grit 7" dia. steel backed silicon carbide wheels. Ideal for metal bonded or Resinoid bonded diamond wheels.

Order from your dealer or write direct. Request literature. No obligation.

CRITERION MACHINE WORKS
BEVERLY HILLS CALIFORNIA

DEMING INDICATOR SET



A sensitive precision test indicator has been developed by Deming Indicator Div., Garrison Machine Works, Inc., 9 Emily St., Dayton, 7, Ohio. It is intended for use of mechanics, jig borer operators, gage makers and others requiring extremely sensitive indicators which will repeat. It is very compact and the size of carrying case shown is 6⅛x2⅝". High priorities are necessary for reasonable deliveries.

TAKING THE TOOL *TO THE JOB* . . .

Speeds up Grinding, Drilling and Finishing Operations

STOW FLEXIBLE SHAFT

Mobile Power Units . . .

In these times when every minute counts, you want your electric tools to have both mobility and ruggedness. When you wheel a Stow machine up to the work, you know you can depend on its sturdy motor. And its flexible shaft has the capacity and long life in heavy-duty service which STOW'S 68-year experience alone makes possible.

Stow mobile units operate from any electric outlet. They eliminate the need to move heavy work to a stationary tool. Often they operate where ordinary tools can't reach. Many interchangeable attachments are available, to fit the machine for almost any job.

You are certain to have many uses for these efficient, versatile machines. Write today for complete information on models, sizes, prices.

STOW Manufacturing Co.

30 Shear St., Binghamton, N. Y.

The only hand grinder with spindle speed of 100,000 R.P.M. on 100 pounds air pressure. It has revolutionized hand grinder performance. Can be directed in any working position; operates with extreme ease. Steel construction throughout. Formed to fit the hand. Weighs only 14 ounces. WRITE FOR CIRCULAR.

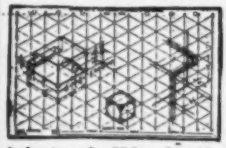
M·B PRODUCTS
130-134 E. LARNED ST.
DETROIT 26, MICHIGAN

EXPORT SALES:

EXPERIENCED EXPORT SPECIALIST—OUTSTANDING RECORD OF ACHIEVEMENT, WILL CREATE PERMANENT, PROFITABLE EXPORT BUSINESS FOR MANUFACTURER. SMALL HAND OR POWER TOOLS, DRILLS, WRENCHES, TAPS & REAMERS PREFERRED.
OTHER LINES CONSIDERED.

BOX B-8, MACHINE TOOL BLUE BOOK
55 WEST 42nd ST., NEW YORK 19, N. Y.

ISOMETRIC SKETCHES ARE



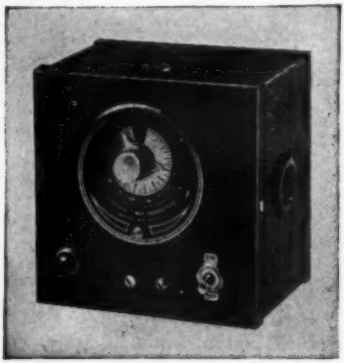
EASY TO MAKE AND READ!

One trial will make you another steady user of WADE'S ISOMETRIC blue lined paper. Shows all surfaces and interior to scale. Makes clear blueprints. Saves time daily in hundreds of plants. Write for Circular.

Wade Instrument Co.
1422 E. 100th St. Dept. H, Cleveland, Ohio

SIGNALLING TIMER

A new, Series S, Signalling Timer has been developed by Industrial Timer Corp., 117 Edison Pl., Newark, N. J. This timer is designed to command visual and audible attention the instant a time interval is completed. It is claimed to be



exceptionally versatile in applications, in that it provides for the automatic closing or opening of a circuit at the end of elapsed time, and operates additional buzzers, bells or lights at remote locations.

Their bulletin A-14 gives detailed information on operation, optional provisions and specifications, as well as circuits and diagrams giving additional data.

SKILSAW CATALOG—MANUAL

"How To Get The Most From Your Portable Electric Tools" is the title of a big Special Section in the new catalog just published by Skilsaw. Designed as a handy guide to greater production and longer tool life, this War-time maintenance manual is full of illustrations and valuable suggestions on the care and operation of portable electric tools.

It carries complete data on and working illustrations of Skilsaw Portable Electric Tools. Reports from the field indicate that the new Catalog and Manual are being received with enthusiasm. Free copies may be obtained by addressing Skilsaw, Inc., 5035 Elston Ave., Chicago 30, Ill.

Ask the opinion of any production man who is using Super Carboloy Tipped Milling Cutters and you'll hear some enthusiastic comments.

He will talk about faster milling that decreases the cutting time on some jobs as much as 200%. He'll mention feeds in cast iron and non-ferrous materials of .002" to .005" per tooth and in steel of .0005" to .0025" per tooth at surface speeds of 400 to 800 feet per minute. He will tell you, too, of the greater accuracy that results from these faster speeds because of less work distortion. And when you ask about finishes, he will show you finishes that compare favorably with ground surfaces.

Then ask about Economy. That's when his eyes will *really* sparkle! For the prices on these milling cutters permit their use on short as well as long run jobs. And they are designed to be used for plain milling, slotting or side milling without alteration. Try Super Carboloy Tipped Milling Cutters once and you, too, will say they're "Super." Write today for descriptive folders and prices. ***All sizes available from stock for immediate shipment.***

OTHER SUPER CARBIDE TIPPED TOOLS FOR

Turning, Facing, Reaming, Spotfacing, Forming, Grinder Rests, Wear Parts, Boring, Drilling, Grooving, Counterboring, Shaving, Centers and Special Purposes

SUPER TOOL COMPANY

Carbide Tipped Tools

21650 Hoover Road
Detroit 13, Mich.

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Glendale 4, California

PRECISION SCRAPED SURFACE PLATES

Royal Surface Plates, made of close grained, high strength cast iron, are carefully scraped and designed to conform to close tolerance and to provide accurate tool inspection.

SIZE	WEIGHT	PRICE
10 x 15	49	$ 45
12 x 12	46	40
12 x 18	77	60
18 x 24	133	120
18 x 36	245	165

IMMEDIATE DELIVERY

ROYAL MACHINERY

401 BROOME ST., NEW YORK 13, N. Y.

BARCO ACCURACY EQUIPMENT

Now available is a new 6-page bulletin recently issued by the Barco Scraping Co., 1975 E. 65th St. Cleveland, 3, Ohio. It contains illustrations and descriptions of their surface plates, angle irons, and straight edges. The company states they can make immediate shipments from stock, and will be glad to furnish the name of their nearest representative, upon request.

SMALL DIAMETER LAPS

A variety of sizes is now available in smaller laps being sold under the trade name Acro Needle Eye Laps.

According to the manufacturer, these laps are not split from the end, but rather like the eye in a needle with the opening a short distance from the end. This feature, it is claimed, produces a barrel-shaped lapping effect, and eliminates "bell-mouthing" encountered with split-end laps.

It is further said that these new laps can be expanded as desired to meet next larger size lap. This permits lapping holes from minimum to maximum sizes. Stock sizes range from 1/16" to 5/32".

Complete details may be obtained by writing to Acro Tool & Die Works, 4892 N. Clark St., Chicago, Ill.

IMMEDIATE ★ DELIVERY! ★ ATLAS DIE FILING MACHINES

Can be used for all kinds of die making. The overarm is constructed so that the file and saw attachments may be interchanged with little effort. The holddown fingers are attached directly to the overarm. Working surface of the table, which tilts two directions, is entirely clear. An improved type chuck, consisting of movable hardened jaws, holds both saws and files. Screw adjustment makes changes easy and fast.

Price Complete With Motor

$125.00

F. O. B. NET CHICAGO

ATLAS EQUIPMENT CO.

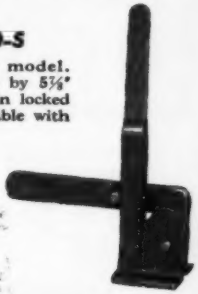
103 S. Clinton St., Chicago, Ill.

DE-STA-CO *Toggle* CLAMPS
for CLAMPING PARTS IN PRODUCTION

Used for clamping production parts in fixtures, as for machining, drilling, reaming, riveting, welding, sawing, routing or assembly operations. Easy, positive clamping, instant release. The modern, efficient, low-cost method. Also used for clamping plywood and plastic parts.

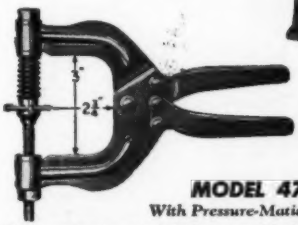
MODEL 210-S

A medium heavy model. Measures 7⅛" high by 5⅞" wide overall when in locked position. Also available with "U" shape bar.



MODEL 205-A

A small, light duty, horizontal style clamp. In this model clamping bolt is provided with rubber tip to prevent marring surface finish of part to be clamped. Measures 1⅛" from bottom to top of base, and 5⅜" from tip to tip when in locked position.

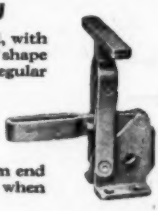


MODEL 470
With Pressure-Matic Feature

A portable clamp with Pressure-Matic feature which provides automatic adjustment from any selected set clamping thickness up to as much as ⅜" variation without gap readjustment. Spindles copper plated against welding spatter. Quicker—easier than "C" clamps.

MODEL 207-TU

A small light duty model, with "T" shape handle and "U" shape bar. Also available with regular shape handle and with solid, straight bar. Model illustrated measures 2⅜" from bottom of base to top of work arm and 3⅞" from end of work bar to end of base when in locked position.



MODEL 462

Small portable clamp, only 7¼" long. Pressure-Matic provides automatic adjustment of spindle gap, no manual adjusting to do. Clamps any thickness from 0" to ⅜".

Send for De-Sta-Co Clamps Catalog

DETROIT STAMPING CO.
Established Over 25 Years
347 Midland Ave • Detroit 3, Mich.

SMALL MACHINE TOOLS & EQUIPMENT

Cutting Tools, Specialty Tools, Band Saw Machines, Lathe and Milling Machine Accessories. All Items stocked for Quick Delivery.

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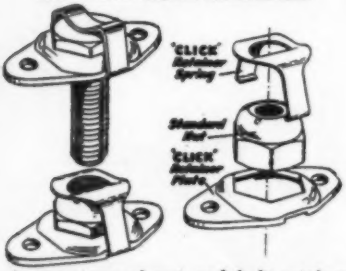
NUT AND BOLT RETAINER



A new type of nut and bolt retainer, designated as "Click" produced by Kaynar Mfg. Co., Los Angeles, is adaptable to any aircraft, marine or ordnance nut or bolt, and is inter-changeable with present types of anchor fittings.

The simple design consists of a retainer plate and a retainer spring, both of cadmium plated tempered spring steel.

Incorporating the features of standard anchor nuts, "Click" also provides a nut anchor that can be spot welded to the assembly without affecting its serviceability as well as a bolt anchor using standard AN bolts, both with axial flexibility. Makers point out that by the use of this item, stud retainers can be riveted or spot welded early in production and the bolt inserted and locked in place with the retainer spring any time later.

SOMMERFELD LATHES BULLETINS

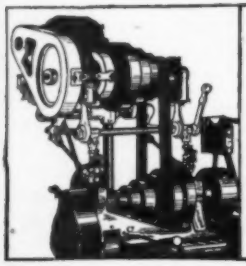
A series of three colorful 8-page bulletins have been published by Sommerfeld Machine Co., Braddock, Pa., describing the complete line of Lathes—(formerly known as "Pittsburgh" Lathes).

Group I Bulletin describes and illustrates features of the heavy duty 27 and 32" Lathes and 36" medium duty lathes.

Group II Bulletin gives details on extra heavy duty 36" and heavy duty 42" lathes, while the Group III Bulletin covers 50 and 60" heavy duty lathes.

Makers state that an unusual feature of Group II and III lathes is that those sizes may be obtained for simultaneous boring and turning. Boring bar saddle is driven by a separate lead screw, thus permitting both operations to be done at once.

The three data booklets furnish complete specifications, and design information.



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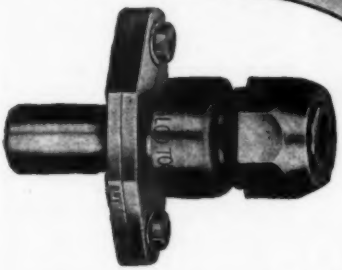
for LATHES, SHAPERS, DRILLS, MILLING MACHINES, etc.

Releasing Model Tap and Die Holders

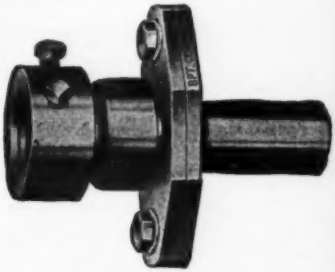
for HAND SCREW MACHINES

by ALCO

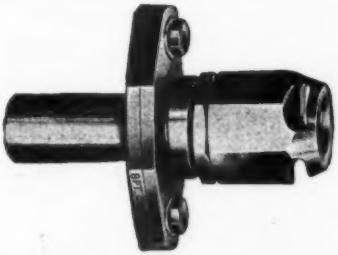
for TURRET LATHES



RELEASING TAP HOLDER . . . Holds taps securely by direct application of pressure in jaws — NO BUSHINGS NEEDED. Full floating flanges set taps absolutely concentric with hole. Result: Even wear on all leads of tap, no tap breakage, perfect threads.



RELEASING BUTTON DIE HOLDER . . . Simple button dies deliver full measure of high grade production in the ALCO holder. Adjustable, concentric alignment feature of this tool insures perfect threads and makes dies last longer.



RELEASING ACORN DIE HOLDER . . . The only acorn type releasing model with adjustable concentric alignment. Quick and positive set-up. Chip elimination and effective lubrication through adequate openings. Rigid drive mechanism — no pins used.

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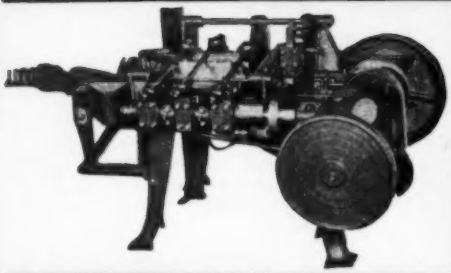

The Nilson Automatic Metal and Wire Forming Machine meets today's industrial requirements. Here are some of the features of this machine: Open construction of press and forming tools. Patented slide feed with an independent cam-operated wire gripping device. Power operating wire feed is transmitted through a straight line.

Write today for information

The A. H. NILSON Machine Co.
BRIDGEPORT, CONN., U.S.A.

FOX SWING FRAME GRINDER

A new bulletin is available describing the ruggedness and easy maneuverability of the new Fox No. 6-4 Hi-Speed Swing Frame Grinder. Information is given as to the construction features, easy operation, good vision at grinding point and the two year manufacturer's mechanical guarantee. Copies are available upon request to Fox Grinders, Inc., 1612 Oliver Building, Pittsburgh (22), Pa.

NEW UNDER-FOOT SAFETY MATS

Sur-Mat, a new product has been developed to reduce leg-strain and minimize under-foot hazards. It is said to have several special features not found in ordinary floor mats. Made of long wearing hardwood sections, woven together with galvanized, rust-resisting spring wire, the Sur-Mat snugly follows the contour of the floor and assures a firm but restful footing. The beveled ends reduce tripping hazards and the open-work design permits filings, metal chips, sawdust, etc., to fall therein and provide a safe, clean footing for the worker.

A special nesting feature for adjoining sections permits the use of Sur-Mats around all types of machinery. Yet, regardless of size and the number of sections used, it lies as one solid continuous mat and does not shrink. It is quickly and easily rolled for floor cleaning purposes, and rolls back into place in a jiffy.

For further information write the Surty Mfg. Co., Inc., Dept. M. T. 4139 W. Kinzie St., Chicago, Ill.

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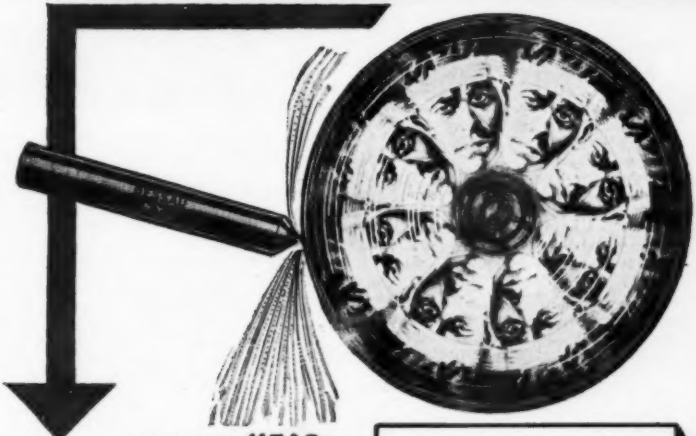
. . . THE RIGHT DIAMOND TOOL !!!



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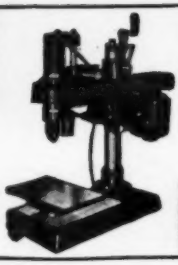

Utmost precision . . . always dependable . . . unwavering accuracy . . . time-saving . . . cost-saving.

Drills holes from .004" to .250" diameter.

THE HAMILTON TOOL CO.
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NORBIDE GAGES

An attractive new 12 page bulletin describes this new product of the Norton Co.'s Research Laboratories, Worcester,6, Mass. The product is Norbide, trademark for Norton Boron carbide, which is said to be the hardest material yet produced for commercial use and second only to the diamond in hardness.

The makers point out that the unusual hardness and density characteristics of Norbide molded shapes, together with their resistance to abrasion and scratching, make them particularly desirable for use in gaging and measuring devices. The new material is said to be practically inert and to withstand chemicals ordinarily employed where gages are used. Because of extreme hardness tho, Norbide gages should be handled with the same consideration given to the handling of fine Chinaware.

Norbide gages are not suggested for use under conditions of compressive friction, such as, the wearing surfaces of steadyrests, automatic sizing gages as used on grinding machines, or as indicator tips for inspecting cast iron cylinders. However, the molded shapes are being employed for a wide variety of plug, ring, keyway and snap gages, also for micrometers, indicator points, gage blocks, radius gages, etc. The bulletin gives considerable information as to sizes available, methods of handling, mounting, etc.

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Made of Plastic in thicknesses from .001" — .030". Each thickness can be identified by its color.

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Send for detailed circular and price list.

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REED VERNIER MICROMETERS

An eight page folder, announcing the new policy of equipping 1, 2, and 3" micrometers with facilities for vernier reading to 1/10,000 of an inch, without extra cost, has been issued by George Scherr Co., 122 Lafayette St., New York 13, N. Y. It describes and illustrates their methods of producing these instruments and contains much information helpful to the users of micrometers.

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THREAD GAUGES
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Avoid rejections. Check all threads with our precision gauges. All sizes to order from 0-80 NF to 12-inch diameter in NF, NC, NS, Acme, metric and special pitches. Send blueprints or specifications today for quotations.

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TRADE DISCOUNT 60%

This means that you can get the keen-edged performance and longer life of these superior small reamers for the same first cost as ordinary milled-flute reamers.

The useful-life cost of L&I Reamers is far less than other reamers — because they are carefully lapped after the flutes have been ground.

The smoother surface finish and extreme accuracy are *plus* values — made possible because L&I Ground Flute Reamers are heat treated in bar form, and *ground in the solid.*

Straight Flute Reamers in Diameters Up to ¼". Trial Orders Suggested.

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BEGINS AT THE BASE

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Scientifically designed leveling jacks for any equipment which demands extreme accuracy.

Standard Size No. 100A (base 6⅝x9⅜, average height 2¾, top section 4"x4¾") will fit most requirements.

Extra large base & screw assures permanent accuracy. Angular faces are finished.

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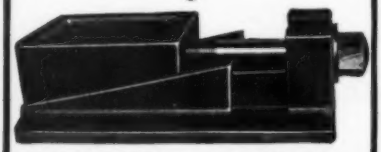

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2305 Hilton Rd., Ferndale, Mich.

BODY-FLO MAGNETIC CHUCKS

E. H. Brandenburg, Sales Manager, announces that Magnetic Holding Devices, Inc., an Ohio incorporation, with offices at 2034 E. 22nd St., Cleveland, 15, O., are the successors of Anderson & Brown Co.

"Body Flo" Magnetic Chucks is the name given to the line of products being sold by this company. The name was coined by Mr. Brandenburg and has been used as a descriptive phrase.

Their chucks are said to embody a new holding technique, and are being applied successfully on surface grinders, planers, shapers and other special machines where they eliminate clamping and, in many cases, the need for special fixtures.

The chucks are also being incorporated by tool and methods engineers with their special holding fixtures; for example, holding forged steel airplane propeller blades, which application greatly speeded production, reduced operating cost, and saved 50,000 manhours per year.

Another recent application in aircraft production on some vital parts is said to have eliminated a battery of millers and 60 employees where the chucks successfully held this work on one grinder, increasing production and eliminating a serious bottleneck.

Manufacturers have prepared and made available to tool and methods engineers "Magnetic Chucking Revolutionized", giving a complete illustration of the technique and practical set-ups that may be made with this chuck.

END MILL CONSERVATION

A booklet entitled—"The Strange Case of the Murdered End Mill," with presentation brochure, has been issued by Melin Mills, 2228 Bellevue Ave., Detroit 7, Mich. It tells how to overcome production troubles and contains other timely information on increasing the life of end mills. Publicity material includes shop posters, speed charts and "how to" bulletins.

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The World's Best Rubberized abrasives for Fine Grinding and Polishing

Attach this advertisement to your card or letterhead. We will send you a *free* trial sample. Or if you prefer send $1.00 for Special 33 wheel assortment.

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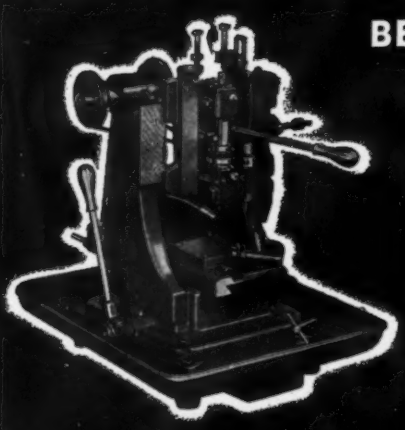
You Can Do a Wide Range of Work With This Wade MOTOR DRIVEN BENCH PROFILER



FOR SMALL PROFILING, MILLING, SLOTTING, RECESSING AND ROUTING OPERATIONS

SPECIFICATIONS

Working area:
2" x 4" horizontal, 1¼" vertical
Fixture block: 4" x 4" x ½"
Work surface of table: 4¼" x 4"
Travel of vertical slide: 1¼"
Travel of table: 4½"
Travel of cross slide: 2"
Cutting tool collet: Any standard size up to 5/16" dia. Standard ¼" collet supplied unless otherwise specified.
Distance of table to nose of spindle, when down: 2¾"
Center distance, cutter spindle to follower: Approx. 2-1/16"
Follower cutter spindle: No. 2 B&S taper
Motor: Standard ¼ h.p., 3-phase
Speeds: Four speeds ranging from 1000 to 8000 RPM
Dimensions: 19" wide, 24" long, 22" high.
Weight: Net, 260 lbs., boxed, 285 lbs.

You can do a wide range of precision work with this Wade Motor Driven Bench Profiler . work such as profiling, milling, slotting, recessing and routing operations . . . on a variety of small parts such as watch and clock plates, clock mechanisms, mechanical time fuses, parts for small firearms, range finder parts, typewriter and adding machine parts, etc.

It is a precision built profiler for production work. Women and unskilled help can quickly become expert in its operation and turn out duplicate precision work within exceedingly close tolerances.

The Wade Bench Profiler is a time and money saver . . . a small, moderately priced machine tool that will pay for itself over and over in your production line.

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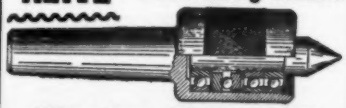

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A new instrument for precision measuring of internal and external dimensions held to very close tolerances has been developed by the Sheffield Corp., Dayton, Ohio.

As an internal dimension comparator it can be used for checking master and working ring gages, setting snap and length gages, and for other similar high precision work. It will check diameters or other internal dimensions from ¾ to 12" and explore a hole to a depth of 3". An open hole may be checked to a depth of 3" from one side, the piece turned over, and an additional check of 3" made from the other side, or a total of 6". Taper, bell-mouth and out-of-round conditions can be discovered and measured.

When used as an external comparator it will check rounds, straights and tapers within a maximum dimension of 12". It is claimed that this is one of the few instruments with which the small diameter of a taper can be easily and precisely checked.

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10 TON CAPACITY YET SENSITIVE ENOUGH TO BEND SHAFT A MINIMUM OF .001"

Speed Up Your Checking & Straightening Jobs

The latest and most practical type of power press . . . sensitive, speedy, accurate. Developed to supplement the highly successful line of Anderson Hydraulic Hand Presses. With a capacity up to 10 tons it is so sensitive and so accurate that a shaft may be bent as little as a .001 of an inch.

The pressure gauge, indicating ram loading, is mounted near the work at eye level to facilitate quantity production. Beneath the ram, at the point of maximum deflection of the work piece, is located an adjustable dial indicator.

This indicator clearly shows amount of shaft run-out in pre-loaded, fully loaded, and unloaded positions.

Use of the Hydraulic system on this press provides distinct advantages over conventional types.

A flexible, sensitive control of press is made possible by means of a unique rotary control valve. This valve is operated from the front of the machine by a control lever which, when depressed, causes a corresponding increase in the load applied to the work. An infinite range of loading up to capacity is obtainable as the lever is moved from 0 to maximum displacement. Push button control of the hydraulic unit.

The length of press work table is 60 inches. Available table attachments include checking rolls, spring loaded centers, adjustable anvils and indicator. To further aid production speed, an adjustable stop collar is provided which may be used to limit the 6" maximum stroke of the ram. Hand operated control equipment is standard but extra provision can be made for foot operation upon request.

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ANDERSON BROS. MFG. CO.
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NEW 12th EDITION

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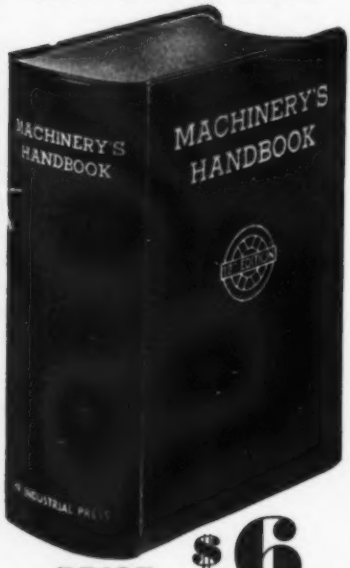

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Send for latest 54-page Catalog showing new time-saving tools for machine shops and aircraft plants.

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Gaging arms are raised and lowered by an electrical mechanism operated by two push-buttons. Automatic stops prevent arms from raising or lowering beyond 3" range limits. A direct-reading visual counter, graduated in hundredths of an inch, serves as an automatic height indicator, showing at all times, height of gaging arms above lapped table surface.

The electric gaging head provides a new and different type of electrical magnification, 2500 to 1. This device was developed thru collaboration of Sheffield and Westinghouse research engineers, and it is claimed to provide many improvements and advantages in stability of magnification, positive action of indicator and repeated accuracy of readings.

Scale of the Electrigage has a range of .0012" and is graduated in 50-millionths of an inch (.000050"). These graduations are spaced far enough apart so that interpolated readings of approximately .0000125" are possible.

PROFILER REEL FEED

Addition of an automatic reel-type feed mechanism for handling tubes and rods in and out of their patented self-centering type chucks on Profilers is announced by Pines Engineering Co., Aurora, Ill.

Pines Profilers burr, bore, center, face, thread, turn, drill, chamfer and ream one or both ends of tubes or rods simulta-

WE ARE NOW ABLE TO TAKE ADDITIONAL WAR OR POST-WAR WORK! ULTRA-MODERN PLANT AND THE FINEST OF EQUIPMENT

Our plant is staffed with men in management, engineering, designing and production, all having more than 34 years' experience, and who have been handling quickly and efficiently war contracts for large firms.

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High Speed, Vertical JIG BORING and MILLING MACHINE . . . .

. . . a most versatile and ever-ready jig borer for the countless small jobs that confront a busy toolroom. Jigs, dies, patterns, molds, fixtures, etc., are accurately machined to predetermined depths *without* error by means of a direct reading micrometer gauge. Eight spindle speeds permit an exact selection for the particular job.

This compact, sturdy little machine, with its counterbalanced quill to remove backlash, occupies small floor space (18½" x 20") and frees your larger machines for work suited to their greater capacities.

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neously. Several of these machining operations may be performed at the same time and either identical or varied operations may be done on opposite ends.

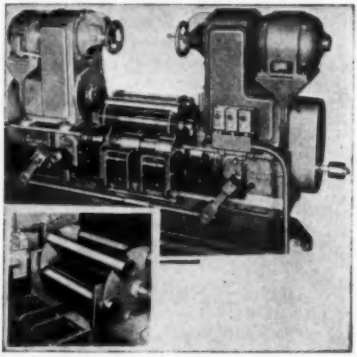

Illustration shows a Profiler equipped with two chucks for holding 3" diameter, 24" long tubes which are end-faced and chamfered simultaneously. The left machine head and chuck are adjustable on the machine bed to accommodate tubes or rods up to 6 feet long. The chucks are equipped with liners for processing tubes or rods from ½" to 3" diameters.

The reel feed is credited with increasing production of Pines Profilers from 600 to 1200 tubes per hour. It can be used with a chute and loaded by the operator at the cut-off machine, the Profiler requiring only occasional attention by an unskilled worker for tool adjustment.

An 8-page profusely illustrated 2-color folder showing a number of types of both single and double spindle Pines Profilers for various machining operations is available from the manufacturer.

CARRUTH SINE PLATE

A sine plate that facilitates the accurate checking of angular measurements in the inspection of tools and production parts is offered by Carruth Sales Co., 704 Boulevard Bldg., Detroit, Mich.

The instrument measures the included angle on tools or production parts ranging from the extremely small to objects as large as 6x10".

The desired angle between the stationary locating plate and the cylindrical

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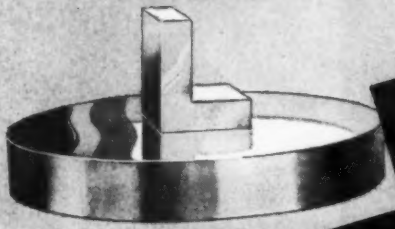

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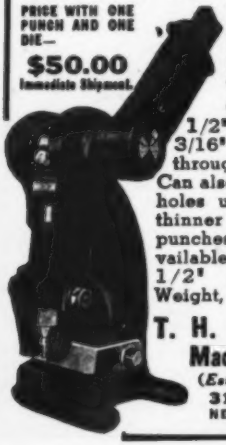

Capacity—1/2" holes through 3/16" steel; 13/32" through 1/4" steel. Can also be made for holes up to 7/8" in thinner metal. Stock punches and dies available from 1/16" to 1/2" by 64ths. Weight, 70 lbs.

T. H. Lewthwaite Machine Co.
(Est. 1890)
311 E. 47th St.,
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gauge bar on the movable block is obtained by building up the angle with gauge blocks. For clamping the work that is being inspected, the block is provided with 54 tapped holes of 3/8" diameter.

The movable block is equipped with a guide plate at one end and also a guide plate which can be used on either side—whichever is more convenient, as governed by the nature of the tool or production part that is being inspected.

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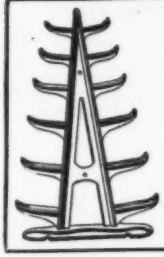

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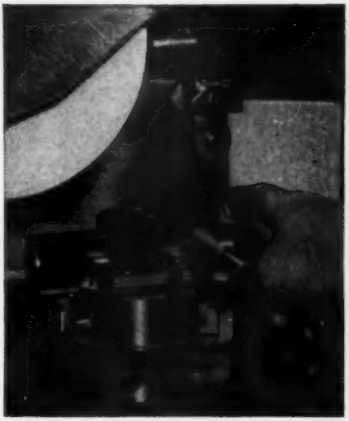

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Many other diversified forms to meet requirements.

Wheel size capacity—9" dia; angular travel 3"; for use on universal surface and cylindrical grinders.

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Noted for maintaining original accuracy over a longer period Criterion Heads are smooth, compact, rigid. Parts subject to wear are hardened. Lead screw is hardened tool steel, with threads ground from solid after hardening. All heads have large, graduated dial. Large offset adjustment eliminates need for offset boring bars. Two sizes: 1½" and 3". ½" and 1" bar capacity. Shanks are interchangeable, enabling operator to use head on different machines. Ideally adapted for slide boring tool holder on small turret lathes. Ask your dealer or order direct. Request free literature.

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BACKSTAND IDLERS

Of recent years, there has been a decided trend toward the development of machinery that is calculated to make the most of coated abrasives. Many of these developments have involved the use of continuous abrasive belts. The backstand idler, so-called, is one of the most recent developments along this line. Its function is to adapt the regular polishing jack or stand for carrying an abrasive belt instead of a buffing wheel.

Naturally, some of the firms that have developed other machinery along the abrasive belt line have brought out backstand idlers. One firm offers an abrasive belt machine used for polishing the insides of metal tubes. They have also developed a machine that carries a very wide abrasive belt for polishing sheet stock. In addition to other abrasive belt equipment, they now have added a backstand idler to their line of equipment.

In running an abrasive belt over a polishing or grinding jack by the use of a backstand idler, the regular grinding or buffing wheel is replaced with a special wheel on the arbor. This wheel has just enough resiliency to drive the abrasive belt without slippage.

One firm providing backstand idlers has designed the idler so that the idle pulley at the back is carried at the top of a round pedestal. This pulley is counterweighted in such manner as to provide a tensional pull against the abrasive belt sufficient to keep it taut at all times, and thus in proper condition for service. The arrangement is such that belts can be quickly changed, when one with a different size grit is needed for any given job.

Backstand idlers have also been developed by some manufacturers of polishing and buffing lathes. Therefore, one can now purchase a polishing stand and a backstand idler to go with it all from the same source, if desired.

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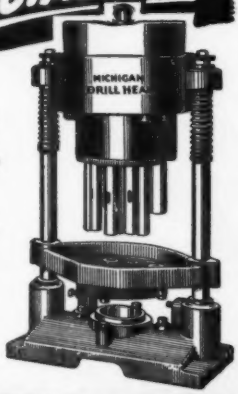
6 Spindle Head and Bushing Plate with Self Clamping Fixture.



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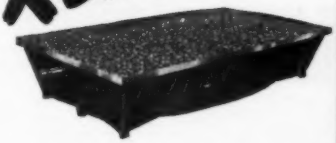

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CRITERION MACHINE WORKS
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LUBRICATION

Many of us blithely agree that lubrication is the life of a machine, and then let it go at that. The reason, perhaps, is not that we are wilfully neglectful, but that we are busy about other things. Were it not for the fact that others have developed lubricants and lubricating devices that meet our needs, we should soon be in a bad state of affairs.

Some of the methods that have been used for delivering oil to a mechanism in measured amounts are very clever indeed. Such a case was noted in a device developed by the manufacturer of a line of vacuum pumps, to lubricate his own equipment. It is also suitable and has been made available for many other kinds of machinery.

This layout consists of two composite components. One of these is a constant-level device of the ordinary type with which most of us are familiar in some degree, which keeps lubricating oil at a constant level in a small trough provided for the purpose.

The other portion of the device operates from the machine being lubricated. To explain it as simply as possible, let us say that a disc indirectly attached to the machine is so arranged that it carries a stud from which a pin is suspended. As this disc revolves, the pin is carried thru the oil in the trough mentioned, time after time. As it emerges from the oil, this hanging pin encounters a special wiper which delivers the oil it carries into a feed tube leading to the bearing which is being lubricated. Simply by adjusting the length of the pin, the amount of oil it picks up at each cycle may be adjusted, and thereby the supply of oil to the bearing may be increased or decreased as the conditions may warrant.

Of course, many forms of equipment are best fitted with some type of force feed lubricator. Such units are too complex for description here.

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PROMPT SHIPMENT

Save floor space, save power, and eliminate line shaft expense by installing MODERN MOTOR DRIVES in your plant. All drives are ball-bearing equipped and designed to fit practically every machine tool. Soundly engineered for long life.

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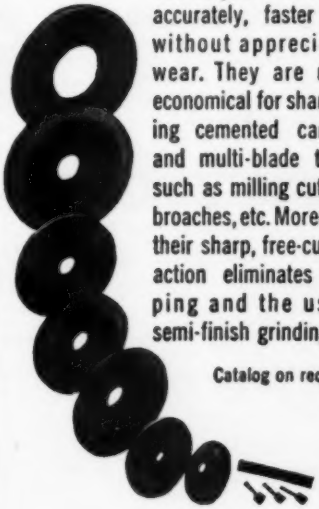

can do your work more accurately, faster and without appreciable wear. They are most economical for sharpening cemented carbide and multi-blade tools, such as milling cutters, broaches, etc. Moreover, their sharp, free-cutting action eliminates lapping and the usual semi-finish grinding.

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CUTTER SHARPENING

We are all more or less conversant, with the many excellent universal grinding machines that have been developed, especially with tool and cutter sharpening in view. In plants where such units cannot be installed for any reason, or in those places where machines of this kind that may be on hand are continually overcrowded with work, it quite often pays to have auxiliary equipment for sharpening tools and cutters.

Some of the methods that have been devised and put into use for this purpose are very interesting. Use of the surface grinder is a case in point.

Some have adopted the use of a special fixture that can be held on a magnetic chuck at the surface grinder. It incorporates a sharpening arbor on which milling cutters, gear and forming cutters, circular metal-cutting saws and like items may be held for grinding. This fixture allows the work to be done promptly, and yet very accurate grinding of the cutting edges is obtained. In the relatively small shop with a surface grinder which is busy only part of the time, this device is of special benefit.

End mills, facing cutters and counterbores are being sharpened in some plants on an auxiliary grinding fixture designed for use at the drill spindle. The fixture which holds the cutter can be moved or slid on the flat drill table to do the grinding, the tool being held in a V-block type of clamp, so arranged that it can be set at any desired angle. The grinding is done with an arbor-equipped cup wheel, the arbor of the wheel being held in the drill spindle chuck. The work is positioned for exact height by means of an adjustable stop on the fixture, below the V-block clamp mentioned.

There are, however, excellent sharpening fixtures for end mills and like work that are designed for use with any grinder having a flat table. No table movement is necessary for use of these fixtures.

Model B

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- ✓ Rigid Construction.
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- ✓ Designed for Heavy Cuts with Sustained Accuracy!

A Sturdy, compact Screw Machine Tool for long runs with close tolerances. Swivelling tool bit, and separately adjustable rollers make delicate adjustments possible.

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SIZE		PG 01	PG 1	PG 2	Comm Grnd	Cut Thr
1/4-20	2 flute	X		X		
	3 flute		X			
	4 flute	(X)	(X)	(X)	(X)	(X)
1/4-28	2 flute	X	X	X	X	
	3 flute					
	4 flute	(X)	(X)	(X)	(X)	X
5/16-18	2 flute		X			
	3 flute					
	4 flute	(X)	(X)	(X)	(X)	(X)
5/16-24	2 flute					
	3 flute					
	4 flute	X	X	(X)		
3/8-16	3 flute					
	4 flute	(X)	(X)	(X)		
3/8-24	3 flute					
	4 flute	X	X	(X)		
7/16-14	3 flute					
	4 flute	X	(X)	(X)	(X)	(X)
7/16-20	3 flute					
	4 flute	X	X	(X)	(X)	(X)
1/2-13	3 flute					
	4 flute	(X)	(X)	(X)	(X)	(X)
1/2-20	3 flute				X	
	4 flute	(X)	(X)	(X)	(X)	(X)

SIZE		PG 01	PG 1	PG 2	Comm Grnd	Cut Thr
9/16-12	4 flute	X	(X)	(X)	(X)	
9/16-18	4 flute	X	X	X	X	X
5/8 -11	4 flute	X	(X)	(X)	(X)	(X)
5/8 -18	4 flute	X	(X)	(X)	(X)	(X)
11/16-11	4 flute					
11/16-16	4 flute					
3/4						
					X	X
1 3/8-6	4 flute	X	X	X	X	X
1 3/8-12	4 flute					
1 1/2-6	4 flute				X	X
1 1/2-12	4 flute					

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1/4-28	2 flute	(X)	X	X	(X)	
5/16-18	2 flute	(X)	(X)	X	X	X
5/16-24	2 flute	X	X	(X)	(X)	X
3/8-16	3 flute	X	(X)	(X)	(X)	X
3/8-24	3 flute	X	X	X	X	X

SIZE		PG 01	PG 1	PG 2	Comm Grnd	Cut Thr
7/16-14	3 flute	X	(X)	(X)	(X)	
7/16-20	3 flute	X	X	(X)	(X)	X
1/2-13	3 flute	X	X	X	X	
1/2-20	3 flute	X	(X)	(X)	(X)	

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HANDLING AT PRESS

Special punch press feeds have done much to speed output and reduce labor costs in metal-working plants, feeding coiled stock into the press. Some of these are versatile, feeding from practically any position on any style of die, and handling coiled stock of any practical thickness. Accuracy of feed on some of these devices is almost absolute. One noted will handle material as wide as 4", and the feed is adjustable up to 3", in increments of only .001". It is found adaptable for relatively short runs, for it can be quickly set up for regular operation.

Some of the firms that provide automatic roll feeds for stamping press operations on coiled strip stock also furnish reel stands to go with them. They provide for unreeling the coil and for supporting it in suitable position to be fed. There is one in particular that is furnishing a self-centering motor-driven reel. Where a coil is properly centered on a reel, it is properly balanced, and as a result will unreel smoothly. The one mentioned supplies a free loop of stock to the automatic feed, regardless of the weight of the coil. It will handle material as wide as 6½", and coils up to 300 pounds in weight.

In unwinding wide coil stock for delivery to a roll feed, something different than the ordinary type of reel is needed. Great weight is present in coils of wide stock, in addition to the difficulty of handling it.

One firm has produced a special type of reel for this purpose, which supports the coil of stock being fed, from its circumference. A gang of sprockets at each end of this reel is utilized to carry four roller chains, and these roller chains are all connected widthwise by means of U-shaped steel slats. Each slat contains a maple wood strip.

The length of the chains, in relation to the distance between the shaft centers on which the sprockets are carried, leaves considerable slack in the top strand.

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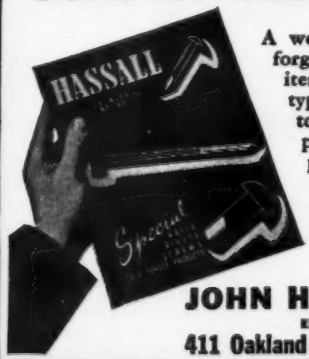

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UNITED PRECISION PRODUCTS CO.

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PUNCHING HOLES

Hole punching tools and devices found in any shop will vary with the size range of holes being punched, the thickness of the stock, and the quantity of this type of work. Hole punching equipment usually has reference to round holes, but this is not always the case, for holes of other shapes may be punched.

Some firms make lines of hand-operated punches that are ideal for punching a moderate number of holes which are not too large in diameter, and in stock that is not too heavy to be handled in this manner. One provides a hand punch that will produce holes up to ¼" in 16-gage metal. A larger one has a capacity for ⅜" holes thru ¼" iron, and a still larger one, fitted with ball bearings, will put ½" holes thru ½" iron. Other punches are made by this same company, but these are interesting examples of what can be done with hand-operated tools, which can be had in numerous types.

Punches and dies for different shapes of holes may be purchased separately for application to hole punching equipment. Such tools for round, square, and other shaped holes are available. On the other hand, you may prefer to make your own, especially if you are handling any large production on hole punching. Much depends on having the right tool steel for hole punches. One firm produces a special high-speed steel that has been found especially good for making nut punches. Obviously it would be just as good for punching holes in other types of metal work.

There are jobs that involve a considerable number of holes of different sizes and shapes, incorporated into a design in sheet metal, where only a few pieces of a kind are to be made. Undoubtedly the best answer to a proposition of this kind is a turret punch. With a good turret punch, carrying all the different punches necessary, time needed on short run piercing operations can be greatly reduced.

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STANDARD PLAIN CYLINDRICAL PLUG BLANKS
Prepared for final finish
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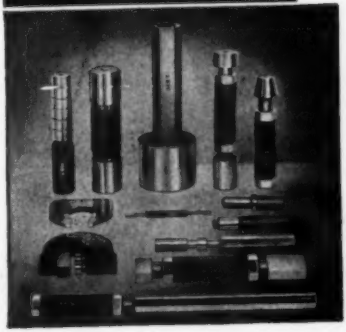

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All made to Standards or Drawings

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QUOTATIONS AND LITERATURE ON REQUEST

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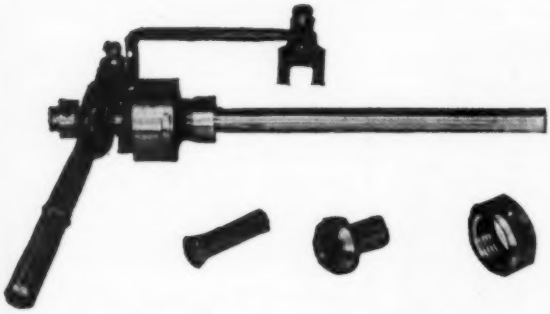
Here Is Another Unsurpassed Machine Tool

from Crozier Craftsmen

This heavy-duty collet closing attachment is typical of Crozier leadership. Improved design originated by Crozier-craftsmen years ago. Has often been imitated, it has not been equalled. Adapted to standard and 1-A, 3-C or 3-SB collets.



A Collet Closing Attachment

Ideal for second operation work. Converts Atlas, Logan, South Bend and other small lathes to high production units. Allows changing stock while spindle is running. Precision construction. Trouble free. One-half inch capacity—$65. Other sizes priced in proportion. Send today for complete information.

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WIRE WORKING

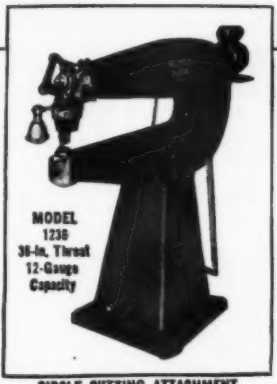
While the mention of wire usually brings to mind a picture of round wire, such as is commonly used, it is a fact that there are many kinds of wire cross-sections. Some manufacturers of machines and equipment for drawing ordinary round wire, also provide equipment for drawing special shapes of wire thru friction and power driven rolls. Half-round, square, flat, oval and many special shapes are now on the market. Even stainless steel wire is available in some standard shapes other than round.

Firms that are manufacturing wire as such find a very complete line of wire mill equipment available, including wire drawing machines, bull blocks, swagers, spoolers, coilers, pointers, and winders. It may be interesting to know that wire looms, such as used for the weaving of wire cloth, may be had in both light and heavy models from certain firms which also produce wire winding machinery and other related equipment.

Where wire is used extensively on certain types of production lines, much importance attaches to forming it into different products or types of products. It often happens that such operations call for a preliminary straightening of the wire as it is taken from the coils, and special machines have been put into use for that purpose.

Even in cases where forming operations are to be carried out on relatively small lots, there is a hand forming device that is frequently used. This tool is fitted with a hand crank, and is adjustable for different sizes of wire, handling it in diameters from 1/32 to ¼", or from No. 21 to No. 3 gage. It is also readily adjustable for the particular forming operations that are to be done, and will handle square, flat or half-round wire.

Automatic wire forming machines, however, are admittedly the real production tools for all cases where any given item is formed from wire in large amounts. These machines are fitted with slides for doing the forming, and with cam-operated wire gripping devices.



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1236
36-in. Throat
12-Gauge
Capacity

CIRCLE CUTTING ATTACHMENT
Included as Standard Equipment
With This Machine

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Cuts...inside or outside ... straight or curved ... flat sheets or formed work

Even an unskilled operator can follow a scribed line, easily and rapidly. Shears flat or formed sheet metal, internal or external, plain or irregular shapes. Vision is unobstructed; both hands are free to guide work at all times. No resistance to feeding or turning. Action of cutters does not "feed" material. *Write for Bulletin.*

Made in sizes up to 60-in. throat, 10-gauge capacity

Cleaner, smoother edges ...need no finishing

Libert Hi-Speed SHEAR

LIBERT MACHINE COMPANY, GREEN BAY, WIS.

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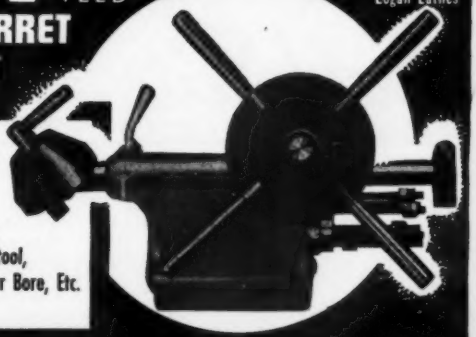
USE **UNIQUE** HAND FEED
TAIL STOCK TURRET ATTACHMENT

For 9-inch South Bend, Atlas, Clausing or Logan Lathes



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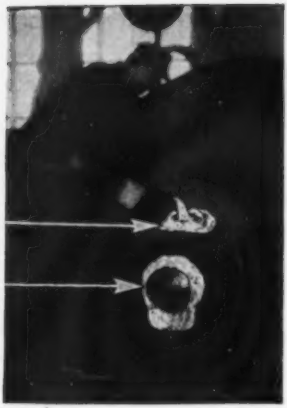

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Write for a liberal sample.

Babbitrite
THE BABBITT RETAINER

PRODUCTS MFG. CO.
509 East Buffalo Street
MILWAUKEE 2, WISCONSIN

DRAWING LUBRICANTS

A mooted subject, indeed, is that of drawing lubricants. Regardless of the fact that the type of lubricant or compound for drawing in a given plant may be subject to argument, it is true that various types have been used to advantage in different places. When a man has used a certain compound in making deep draws, and has had a high degree of success with it, he is very likely to hold to that lubricant to the exclusion of all others, rather than risk any further experiment. Admittedly, therefore, many press operators are prejudiced.

Some are pretty thoroly sold on the use of an anti-friction compound known as "Motor Mica". This material is used for various lubricating problems also, and is added to the cutting oils in many cases. Used for drawing, it is claimed to produce cleaner draws, and to reduce the upkeep necessary on deep - drawing dies.

Graphite compounds are also useful.

Drawing compounds are made by one firm in both water-soluble and oil-soluble types, either pigmented or non-pigmented. Some of these are ready - mixed, others are not. The same firm has produced a special oil for use in the drawing of aluminum. Scratching is claimed to be reduced to a minimum in drawing operations when the material is lubricated by these products.

Lubricants for drawing must have close attention given to their composition, with regard to excessive acidity or alkalinity. A neutral lubricant should be used whenever possible, lest the metal surfaces be affected thru excessive acidity, or the hands of the operator be affected thru the alkalinity of the material.

Some manufacturers of metal cleaning compounds and soaps have placed on the market an emulsible oil which can be combined with various of their soap compounds for use in drawing. Flexibility of compounds is obtained in this way.

To Speed Victory!

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Cold Pipe, Conduit and Tube Bending Machines

Twelve types to select from. **Hand operated capacities to 6" inclusive. Motor operated ½ to 8" inclusive.**

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THE BALL WEARS— NOT THE GEARS!

A special thrust ball in Invincible Angle Tool Attachments takes the wear instead of the gears, giving long service life . . . Invincible tools get into close corners, tight spots . . . save time and expense. Check Invincible today on these versatile, high-speed, long-lasting Angle Drill Attachments.

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If priorities deny you the advantages of McGill Precision Bearings today, remember, *post-war tomorrow* is coming. Experienced McGill engineers are ready to assist you now in improving your *future* bearing applications. This service is yours for the asking. There is no priority on ideas.

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MAGNETIC CHUCKS

Doubtless a host of mechanics using magnetic chucks of one kind or another, have never become acquainted with the rotary type of magnetic chuck equipped with permanent magnets. On such, of course, no electric current is required for operation, and there is no heating. Yet they have strong holding power and will last indefinitely. Not only are they good for use at the grinder, but in other places. The lathe is a case in point. At this machine, they can be used for holding many different kinds of work. There are no wires, and no running costs are involved with such chucks.

Magnetic chucks have been found extremely handy in holding armor plate, such as used on tanks, while different operations are being performed on it. One firm has produced a line of 12" circular type magnetic chucks, which can be held readily in any desirable location with a couple of bolts. A number of them can be used in any one setup when desired. They have saved much clamping time on armor plate at grinders, planers, and flame-cutting tables, operating in parallel on 6 volts d-c, supplied by a rectifier from any convenient 110 or 220-volt a-c line.

One great advantage of these small chuck units is that they are so readily portable. Therefore, they may be moved from the planer to the flame-cutting table or to the grinder as required. It is claimed that they develop a magnetic flux of sufficient intensity to penetrate steel plates 2¼" thick.

Did you know that some magnetic chucks are available which can be used for demagnetizing the work, after the machining operation has been fully performed? Thus, no separate demagnetizer need be kept on hand, and the work is simplified. The firm which makes chucks having this feature also provides magnetic chuck accessories in the form of special parallels. These allow the holding of irregularly-shaped pieces on the chuck.

Automatic Metal Saw Grinder and Retoother

MODEL 1C

PRECISION and ACCURACY AUTOMATICALLY ASSURED

For metal cutting saws 2" to 14" in dia. When specified, saws as small as ¾" dia. and 1/32" to 2" spacing. Also supplied as a Combination Grinder for circular, band and hack saws.

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INDUSTRIAL Couplings

With the **THERMOID HARDY** Flexible discs that aid in eliminating wear and tear on the driving units.

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For firmly gripping drills, keyway cutters and end mills, you can't beat Universal Collet Chucks. Universal Chucks don't marr tool shanks yet grip as strong as solid steel itself. The chuck shown here has National Milling Machine taper shank. Also available are Universal Standard, Floating, and Centering chucks. Write for facts.

UNIVERSAL ENGINEERING
FRANKENMUTH, MICHIGAN

WHERE *Accuracy* COUNTS

B·A·E*

CUTS ERROR

Using circular square and Barco Surface Plate, scraper tests squareness of angle plate faces.

***BARCO ACCURACY EQUIPMENT**

In machine shops, die shops, production plants, inspection departments,— wherever accuracy comes first, B.A.E. (Barco Accuracy Equipment) helps eliminate mistakes. Barco Angle Irons, Straight Edges and Surface Plates are reliable, being hand-scraped within .0002" of perfect flatness; are rigid; have Meehanite's uniform structure and freedom from strain; are heat-treated, heat- and corrosion-resistant. Barco Angle Irons make solid bases for jigs and fixtures.

ASK FOR BULLETIN "B-1"

BARCO SCRAPING COMPANY
1975 East 65th Street Cleveland 3, Ohio

SHIPMENTS FROM STOCK *Now!*

BARCO MEEHANITE SURFACE PLATES

SLOTTED ANGLE IRONS • V • STRAIGHT EDGES

EXPANDING TUBE ENDS

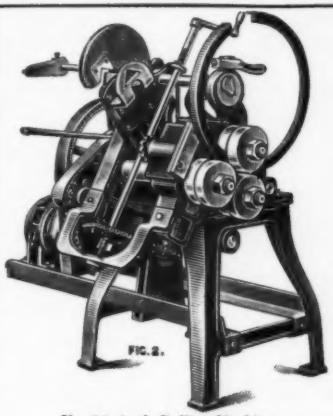
So much additional equipment, designed with tubes that must have the ends expanded to fit them into place properly, comes to hand, that the operation of expanding the ends is of growing importance. The practice of using a ball-faced hammer to turn the ends outward, which caused so many cracks, especially when the tube ends were not properly prepared in advance, is now less frequently used. Various types of expanders are used instead.

Incidentally, one firm which makes a line of tube end expanders has also developed a self-feed tube cutter. It is especially useful in the installation of new steel tubes into boilers and like equipment. The device not only cuts the tubes off to the proper length right at the point of installation, but also provides them with a bevel, so they will be ready for easy beading.

This firm makes a number of different kinds of tube end expanders, there being a full line for steam boiler work, including boilers of stationary, portable, locomotive and marine types. In addition, expanders for tubes going into condensers, heat exchangers, refinery cracking stills and other tube - type structures are furnished. Units are provided of very simple type for occasional use in the small shop. Sectional types of expanders that are inserted into the end of the tube, and then expanded by driving in a tapered pin, with either a hand or power hammer are available. There are also roller expanders for hand use.

In the power type expander, rollers are incorporated. The company furnishing the sectional types mentioned also has a full line of power driven tools. The range of sizes is greater on power driven units, extending from those which will handle one to 6" O. D. tubes. Expanders made by some firms are self-feeding, and in addition have facilities for indicating when the flue or tube has been sufficiently rolled.

A favored method of driving flue or tube expanders is to use an extra-heavy portable air drill. Some of these drills have been particularly designed to make them adaptable for driving these tools.



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ROLLS ANGLES, TEE IRON, PIPE, FLATS, ROUNDS AND SQUARES

CAPACITY—2"x2"x¼" ANGLE

HERE IS A

Machine

THAT HAS FOUND ITS WAY INTO

40 States

used by Manufacturers of

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EXCELSIOR TOOL & MACHINE CO. EAST ST. LOUIS, ILLINOIS

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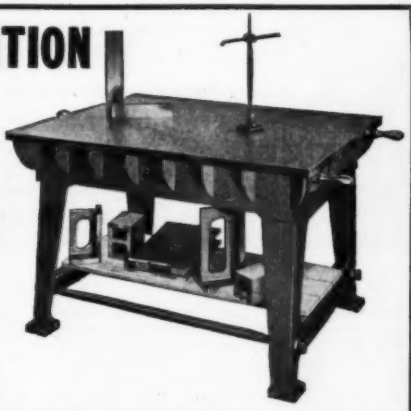

Modern precision machine shops and inspection departments will find this sturdy 36"x 48" MILWAUKEE SURFACE PLATE a valuable addition. Constructed of semi-steel, accurately machined, securely mounted on cast legs which are machined and provided with SAE adjusting screws for perfect alignment. Height from floor to top of plate 30". Can also be had in 38". Shipping weight 1200 lbs.

We also manufacture angles and parallels as shown underneath surface plate.

We also make larger and smaller plates either with planed or scraped surfaces, whichever is desired. *Write today for full information.*

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ARMY E NAVY Order from your distributor

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SHAPERS

Advances made in metal-working shapers have been many. Quite often, something that does not appear to the casual eye is most important. On machines where the design includes automatic lubrication of the forced-feed type, the life of the unit will be much longer, and better work will be produced. One shaper that is lubricated automatically, is fitted out with a multiple disc clutch and brake. It has direct-reading feed and stroke dials, and has a power rapid traverse to cross feeds. Machines of this kind are doing yeoman service in many present day metalworking plants.

On some of the modern shapers of today, hydraulic power is used for driving the ram as well as for feeding the table. The use of hydraulic power insures not only uniform cutting speed, but also uniform cutting pressure, from the beginning to the end of each cut. Chatter marks are more easily eliminated in a machine so driven, and there is less shock on the reversals of the ram.

One firm that has specialized quite largely in hydraulic shaper drives builds a line of standard units. In addition they provide special models, such as open-side units, shaper-planers, etc. The shaper-planer is a machine that makes an especially good showing on work that is somewhat large for the shaper, and somewhat small for the planer. Also, it is especially useful in machining work that is too wide for double-housing machines.

It must not be supposed, of course, that only the hydraulic ram drive is relatively free from shock, for there are mechanical ram drives of the helical gear type being used on some excellent machines. Helical gears do not allow the backlash to occur that can so easily build up otherwise. One machine of this kind has a remarkable provision with regard to lubrication. It actually will not allow the machine to operate unless sufficient lubricating oil is being supplied. The controls on this machine are centralized to make them readily accessible to the operator.

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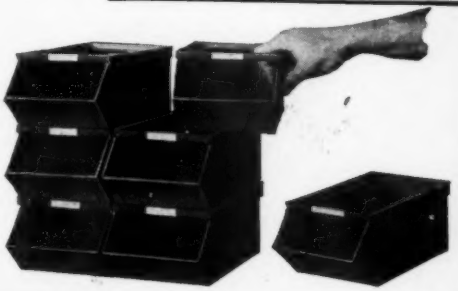
We have been given permission by WPB to manufacture Stackbins to be used as portable containers for production and assembly.

Patented **Stackbins** keep parts and materials instantly accessible—eliminate waste hand motions—stack rigidly to form units of exactly the right shape and capacity at the point of assembly—save time and labor handling parts and materials.



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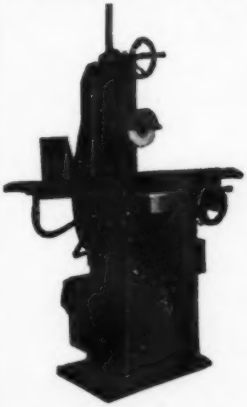
"STACKED AND STILL ACCESSIBLE"

Write today for full details and prices on all-welded steel **Stackbins.** Stackbin Corp., 55 Troy St., Providence, R. I.

SURFACE GRINDERS



Hydraulic Feed – Hand Feed

No. 2HFE Hand Feed 6½x24
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AMERICAN DRILL GRINDERS

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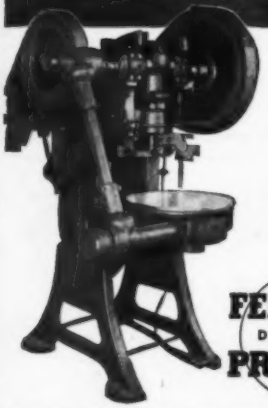

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CAM FOLLOWERS

Cam applications in machinery cover a wide range of fluctuating conditions. A cam may be made to advance a machine part at a uniform rate, or the velocity of the cam follower may change as the circumstances dictate. In advancing a tool such as a tap or a threading die, it is evident that it must be advanced only at a uniform rate. That rate must be the resultant derived from the rpm of the work and pitch of the thread. In many cases, a machine part may be advanced very slowly and retarded speedily, or vice versa. In cases of this kind, inertia forces are present which impart considerable shock to the mechanism at the point of change.

Interesting in this connection is the employment of cam followers that are relatively light in weight, and that have little or no tendency to rebound. Did you know that there is a very heavy and hard tropical wood known as lignum vitae, that has been quite successfully used for cam rollers? It is especially noted for its ability to withstand wear, and is not affected adversely by the presence of water or various types of chemicals.

On the other hand, great progress has been made in meeting the demands imposed by cam shock loads by some anti-friction bearing manufacturers. The advantage of using an anti-friction bearing device as a cam roller is at once evident, provided it be made sufficiently substantial to withstand the severity of the duty imposed upon it. Cam follower full type roller bearings which occupy relatively little space radially, as compared with plain bearings have been developed. These cam roller bearings are effectively sealed against dirt, and may be obtained in a full range of sizes.

It is a fact, however, that use of the anti-friction idea on a cam roller does require the allotment of a certain amount of additional space radially.

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HANDY-
PRACTICAL
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TAP EXTRACTORS
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- ★ No annealing
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Immediate Shipment. Stock sizes No. 4 to 1½", 2, 3, 4 flutes. 30 day free trial.

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FLUXES
to join
All Metals

No matter how tough **your** welding, brazing or silver soldering job may be, there's a Fluxine Flux with which you can make perfect joints. Each Fluxine Flux is scientifically compounded for specific purposes . . . each is the proper flux for a certain job. Write a full explanation of your problems and Krembs will send a free sample of the right flux with instructions for use.

FLUXINE No. 43

For Silver Soldering and Gas Welding Stainless Steel, Inconel, Monel, Nickel and Nickel-Chrome Alloys. Non-Glaring. Used with low melting point silver solders. Meets Navy Spec. No. 51-F-4a; Air Corps Spec. No. 11316-A; Federal Ordnance Dept. Spec. No. AXS-500.

FLUXINE No. 18

For gas welding and atomic hydrogen welding Stainless Steel, Inconel and all Nickel-Chrome Alloys, etc. A Non-Poisoning and Non-Fuming flux. Scale chips off as work cools. Meets Navy Spec. No. 51-F-3a; Air Corps Spec. No. 11314.

KREMBS AND COMPANY

676 West Ohio Street, Chicago, Illinois

Chemists and Metallurgists Since 1875.

FLUXINE

TRADE MARK REGISTERED U.S. PAT. OFF.

FLUXES TO JOIN ALL METALS

DRILL GRINDERS

The ability to grind a drill freehand and get it properly centered, with the correct angles and clearances, was a matter of great importance in the past. The coming of drill grinding machines has made it possible to do the job quite readily. Such machines have changed the picture altogether, for almost any apprentice can grind drills to perfection on some of these machines.

One good drill grinder is fitted with a ¼ hp motor, and is made in three different sizes, the complete range of all three machines handling drills from No. 70 to ¾". Really, the larger and the smaller of the three machines will cover the entire range, for there is considerable overlapping. One of the three may be sufficient to cover the ground in certain types of plants. Various drill sizes are accommodated in a common holder for grinding, by bushing the holder, and providing bushings to accommodate different sizes of drills.

The drill and its holder are mounted between a locating unit atop the motor and a special swinging arm adjacent to the grinding wheel. In this manner the drill is held in grinding position. A holder knob is provided which is turned by the operator, and as this is done, cams on the holder and on the swinging arm produce the correct movement for grinding the drill in the proper manner. A web-thinning attachment is also provided with this machine. When it is used, a special cup wheel with a particular type of flange is employed for that operation. A rack mounted over the top of the wheel serves to hold the extra drill bushings, not in use at a given time, and also serves as a guard.

Drill grinding attachments are available that can be used in connection with bench grinders. These are low in price, and hardly a shop is without a bench grinder.

ERRINGTON MECHANICAL LABORATORY

MAIN OFFICE AND WORKS: STATEN ISLAND, NEW YORK

Chicago Office:
6422 N. RICHMOND STREET

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170 BROADWAY

CLUTCH OR CONE DRIVE

Our High Speed Tappers are Super-Sensitive for Small Tapping

All Styles and Sizes— 0 to 2" Taps

Style B Positive Adjustable stop holds work down

Style C Graduated Adjustable Safety Friction

Style D-E, Quick Change Tools

OPEN END PILING BOXES

NOW AVAILABLE FOR PRODUCTION USE

These boxes can now be furnished to Defense Plants for handling of parts in production and assembly, when used as portable containers.

THE CLEVELAND WIRE SPRING CO., 5250 Brookpark Road, CLEVELAND, OHIO

SHEET METAL DIVISION

Will do 67%
of all Straight Dressing Jobs

67% of all straight wheel dressing jobs can be done efficiently with an American "A-20" Cluster Tool. Made of 20 carefully selected diamonds, arranged in four layers of five stones each, set in a special, low temperature matrix, with each stone so spaced that there will always be several sharp cutting points in contact with the wheel during dressing operations. Stones are all permanently mounted, no re-setting required.

Compare our price with what you have been paying for "Cluster Tools" . . . we promise performance beyond your expectations. Improved production facilities, new methods of setting and volume sales permit us to price the American "A-20" at $15.00 F.O.B. Detroit. Price includes any standard type mounting . . . specify your choice when ordering. Price subject to change without notice.

American
DIAMOND TOOL & GAUGE CO.
15920 WOODINGHAM • DETROIT, MICH.

quickly hardens the wearing surfaces of various parts without substantially affecting the toughness of the core metal, or its resistance to shock. An additional outstanding advantage is that this type of hardening allows the treating of surfaces that cannot be hardened in any other way, due to their size or to their shape.

On the other hand, machine manufacturers whose units produce a given line of work are naturally desirous that if these machines put out high class products, such products shall not later be distorted thru heat treatment. In the case of gears, distortion may be very serious. One prominent manufacturer of a line of gear shapers, which are also adaptable to the shaping of sprockets, cams, intermittent gears and many similar kinds of work, has developed flame hardening apparatus for treating these same products. This manufacturer produced a flame hardener that will handle gears and other circular parts up to 10½" diameter, and shafts up to 36" long. This machine is easy to operate, and simple to change over from one kind of work to another.

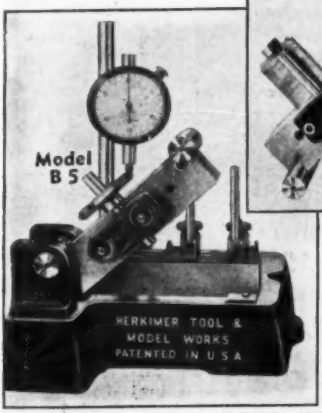
One flame hardening machine, designed especially for sprocket hardening, consists essentially of a circular indexing table which carries the sprockets, and a reciprocating table arranged to approach to or recede from the work. The table carries the heating torch which is of multiple-jet design.

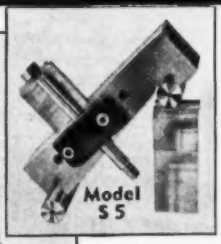
FLAME HARDENING

Undoubtedly the first applications of flame hardening were originally known as torch hardening, usually applied for the local hardening of gear teeth. The torch was used for heating up the teeth locally, and when the temperature was sufficiently high, the teeth were rolled in water. From such early practices, sprang the modern methods of flame hardening.

Therefore, it is not strange to find that manufacturers of equipment used in gas welding and cutting should also have developed some excellent flame hardening apparatus. The use of this equipment

Simplified BEVEL GEAR GAUGING





No Difficult Operations, Involved Calculations or Intricate Manipulations.

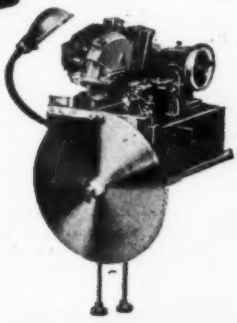
With one set-up on these tools, any operator with ordinary gauging experience and a knowledge of blue print reading, can perform these three important operations:

1. **Check dimensional accuracy of the addendum cone (gear face) as related to thrust face of hub.**
2. **Check accuracy of cone angle.**
3. **Check run-out of gear face.**

Write for descriptive folder.

HERKIMER TOOL & MODEL WORKS, 1010 George St., Herkimer, N. Y.

RECONDITION YOUR OLD SAW BLADES



HERE IS A NEW SAW SALVAGING MACHINE

THE HOWE-LINDSEY AUTOMATIC SAW SHARPENER

Save · TIME · MONEY · CRITICAL MATERIALS

HOWE AND SON, INC. HINSDALE, N. H.

COLLET CHUCK

● **CAN'T-SLIP.** Exclusive Wedge-Lock feature prevents slippage when working either soft or hardest alloy steel, even when material is several thousandths over or under size.

● **ACCURATE.** Combination draw-back and push-out action holds material securely against stop, insures accurate stock length.

● **NO LUBRICATION** of the Armor Collet Chuck is necessary.

● **RUNS COOL.** Revolves with spindle, and so requires no bearings or gears to generate heat or consume power.

● **FULL SPINDLE CAPACITY** for small lathes having 1½"-8 thread spindles.

● **COLLETS IN STOCK.** Collets are available to full spindle capacity in round, square or hexagon type. Adapters are obtainable to accommodate other well known collets.

● **PROMPT DELIVERY.** Write today for Bulletin BB-1

AIRCRAFT MACHINERY CORP.

214 West Orange Drive • Burbank, California

One manufacturer of a line of valves of all kinds makes such fire hose valves to underwriters pattern. These valves are of gate type, and have their hand wheels enameled a bright red, so they will be easily and quickly seen.

There are various kinds of air hose valves that are interesting to the shop operative. Some of these are of nozzle type, and therefore installed at the outlet end of the hose, keeping the compressed air confined without loss until needed.

Another hose valve is especially valuable to the plant which uses a number of pneumatic tools, for it is made in the form of a hose coupling, and has therefore been glorified by the name "valve coupling". Where pneumatic chippers, filers, drills, hammers, grinders etc. are used intermittently in a shop and are attached to a given air line, the operator who has been furnished with such valve couplings in the hose, can change tools right on the spot. It is not necessary to walk back to the air compressor or to the supply line to shut off the air. The valve and the coupling jaws are interlocked so that live air automatically bleeds from the hose when the sleeve unlocks the jaws.

The nozzle type of hose valve is often thought of simply as a nozzle, and yet we know that it incorporates a valve. One firm has provided bronze air nozzles of the hose valve type in two styles.

HOSE VALVES

There are numerous kinds of hose valves available, tho they might not usually be thot of under that name. Some of these are arranged at that end of the hose which might be termed the inlet end, while others are at the outlet end. The plant which is equipped with fire hose will be most conversant with the former, for it is the proper thing to have the valve which will admit water to the hose in an emergency, right at the hose inlet. Specifications for such valves are rigid, for they must not fail in emergencies.

The New No. 47 ★ "ABRASAW" ★

In many respects the NEW 47 "ABRASAW" is similar to the 47W, all outstanding characteristics having been retained. The NEW ABRASAW base is now of a single casting and contains a large coolant tank. The coolant pump being mounted on the rear is now regular equipment.

The cutting head is practically the same as the 47W.

Vises can be furnished for straight cuts only, or in the combination straight and angle type. The vise for straight cuts may be arranged for foot treadle operation at small additional cost.

Write for information and specifications.

The Bridgeport Safety Emery Wheel Co.

1304 BROAD ST.
BRIDGEPORT,
CONN., U.S.A.

MECHANIZE Hand Reaming with the CATSKILL Model R Power Reaming Machine

SPEED UP hand reaming to production line tempo! SAVE time, effort, money!

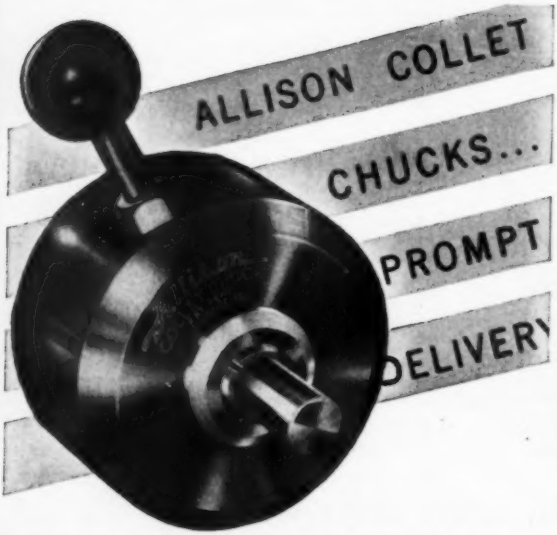
Compact, plug-in unit. Ideal for reaming, de-burring, lapping, chamfering, and special tool applications. A truly versatile power tool.

RANGE of SPEEDS AVAILABLE

WRITE FOR FULL DETAILS

CATSKILL METAL WORKS, INC.
CATSKILL, NEW YORK

Bench or Pedestal Type
MODERATELY PRICED



New Allison Collet Chucks speed production—reduce rejects—give full spindle hole capacity on lathes up to 1½" size—no stopping during operation—fits lathe, mill or drill press—needs no keys or wrenches — no push or draw bar attachments — unsurpassed for production

See your distributor or write for literature.

Allison COLLETS

ROUND HEXAGON SQUARE SERRATED

ALLISON TOOL AND ENGINEERING CO., 4031 Whittier Blvd., Los Angeles, Calif.

EXTRUSION

The process of extrusion carries a continually-increasing significance to the metal-working world. When a sectional shape is needed in lineal form, and can be produced by forcing it thru a die, in a fraction of the time that would be required to shape it by any other method, it is self-evident that the extrusion method is not one that any man can afford to ignore.

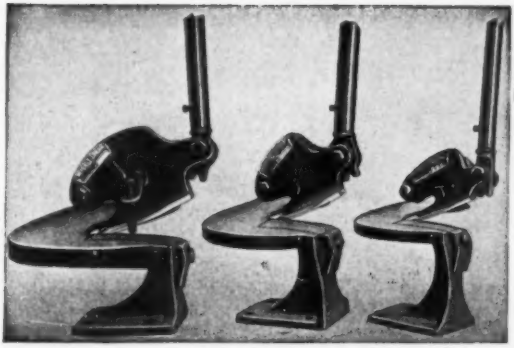
If he has a great deal of material that must be processed to a given sectional shape, it will pay him in many cases to consider the installation of an extrusion press. If he only needs a moderate amount of some given shape, it is quite possible that it may still pay him to purchase it from some firm that is in position to extrude the material.

Because nonferrous metals as a class are more ductile than iron and steel, they are much more readily extruded. There are some who do all their extruding with such metals. Tho the price of materials is higher, the work can sometimes be handled to enough greater advantage to outweigh the price difference.

The same thing happens at the automatic screw machine with regard to leaded, free-cutting brass. Tho it is much higher in price than steel rods, the greater speed at which it can be machined into parts in some cases will entirely eclipse the difference in price. There are various manufacturers of extrusion presses, and most of them have had considerable engineering experience with numerous problems that are peculiar to extrusion work.

There are different steels that have been found suitable for making extrusion dies. On the other hand, the tungsten carbides have found an application here that is expanding rapidly.

One steel manufacturer produces a line of tool steels containing free graphite. One of these steels, known as Graph-Tung, is to be recommended for cold extrusion work. It is used for extrusion dies, both for ferrous and non-ferrous metals.



Get BEVERLY Throatless SHEARS

SAVE TIME ON WAR ORDERS!

If you're cutting straights or irregulars on War orders you can speed 'em up with a BEVERLY Bench-Type Shear. Order No. 1 for 14 Ga., No. 2 for 10 Ga., No. 3 for 3/16" mild steel and 10 ga., stainless.

BEVERLY SHEAR CO., 3005 W. 110th Pl., Chicago, Ill.

SPEED UP FINAL OPERATIONS ON DIES, GEARS, SCREWS, LONG RODS AND SHAFTS WITH COLBORNE Speed Lathes

GOOD DELIVERY

For economical polishing, lapping or finishing of gears, shafts, dies, gages, ball races, long rods, etc.

Built to meet the requirements of those desiring a heavy constructed, smooth running machine of highest quality.

Has large built in motor with variable speed control, using REEVES standard pulley and belt.

Smooth automatic brakes act instantly when switch is thrown. Collets or chuck may be used.

WRITE FOR DETAILS TODAY

COLBORNE MFG. COMPANY
BUILDERS SINCE 1879
157 Division St. Chicago, Ill.

New Clark *Adjustable* Spot Facer and Counterbore

The use of *adjustable* blades, instead of fixed radius bits, on the Clark Adjustable Counterbore and Spot Facer make it possible to cut all fractional diameters from 9/16" to 3½" with only 8 tools. Adjustments for diameters, even in thousandths, are simple and quick.

BLADES OF TANTUNG STEEL

... with 2 to 25 times the life of high-speed steel – cut 2 to 3 times faster – permit heavier cuts and feeds. Because Clark Blades are *adjustable* they can be easily resharpened by hand and reground many more times than fluted cutters. NO BURR PILOTS. This exclusive feature eliminates troublesome, damaging burrs on hole edge. Simple adjustment converts to efficient BORING BAR. Available individually or in complete sets. Replace the *blade*, not the *entire tool*. – Investigate Clark Cutters today!

The same outstanding, inventory-cutting advantages are also found in Clark Adjustable Hole Cutters, Flycutters, Surface Facers and Grinding Fixtures.

SEE YOUR JOBBER — WRITE FOR BULLETIN MT-BB-1

In Canada: DOMINION BEARINGS, LTD., Toronto, Montreal, Winnipeg
Export: THE AMERICAN STEEL EXPORT COMPANY, INC., New York, Los Angeles

Robert H. Clark Company

9330 SANTA MONICA BOULEVARD BEVERLY HILLS CALIF. U.S.A.

DIE DUPLICATION

The application of duplicating or copying controls to various machine tools is an interesting development. It first came to attention with the announcement of a 12-page folder issued by a firm that has perfected such a control for low-cost mold and die duplication. The device could be applied to turret lathes, planers, shapers, millers, etc. Undoubtedly the application of such devices to milling machines of vertical type has been the most interesting and profitable.

Later, another duplicating device of considerable interest was observed. It is a portable outfit, supported on casters so that it may be readily moved to and from a machine or from one machine to another as required. A pattern is used, together with a follower for the pattern, which controls movement of the machine table in such a way that the shape and the contour of the pattern are automatically duplicated by the machine cutter.

When applied to a vertical milling machine, the device is connected by means of a universal shaft to the machine lead screw. The power for cross feeding is obtained from the machine itself. By such means, the contour of the work is controlled.

The device is capable of controlling the most sensitive machines, as well as those of large size. It is, naturally, extremely suitable for die sinking and the machining of die and mold contours, tho it is useful for considerable other work as well, having many applications.

While there is much advantage for many shops in the use of such attachments and auxiliaries as have been mentioned, it is undoubtedly true that where large numbers of dies and molds are to be duplicated, it will be well to have a standard duplicating machine, with the duplicating mechanism built into it as an integral part. These duplicating machines copy from an original die or mold, and have been found especially useful for reproduction of small drop forging dies, die casting dies, and molds for rubber, plastics, glass and similar work.

Blade Breakage Stopped Production Insured

BY INSTALLING

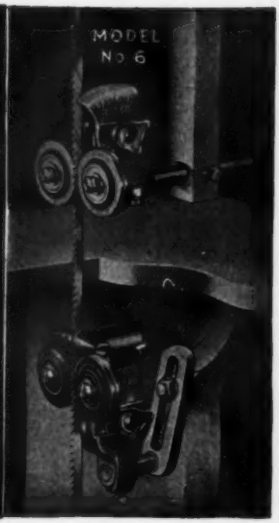
PADDOCK Ball Bearing BAND SAW GUIDES

Recommended for New and Old Machines cutting all material at any speed.

SENT ON 10 DAYS' TRIAL

The use of Paddock Ball Bearing Guides increases the efficiency of the machines so that more and better work can be done. The hazard of operation is reduced. Most of the blade breakage is eliminated. Wheels are interchanged—in effect, three sets of guides in one.

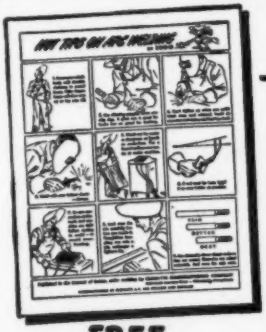
Write for details today and list of prominent manufacturers using Paddock Guides.



PADDOCK TOOL COMPANY

Guide Makers Since 1920

1418 Walnut St., Kansas City, Mo.



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POSTER FOR YOUR SHOP

Suggestions for better, faster, safer welding. Simply write in on your letterhead and say how many copies you can use.

WELD 24 HOURS A DAY

And Don't Worry About Heat Stress or Burnouts

NEW ERGOLYTE A. C. ARC WELDER COOLED BY POWERFUL FAN . . .

The Ergolyte 250F Arc Welder is made to order for war welding. All the regular production-proved features *plus* cooling from a powerful built in fan. Extra heavy insulation . . . No time out needed for "cooling down". Write for information.

ERGOLYTE MANUFACTURING CO., 3631 N. LAWRENCE ST., PHILA., PENNA.

Life Savers!
IDEAL LIVE CENTERS
Increase Center Life. Handle heavier loads, make deeper cuts at higher speeds because they rotate with the work. Built for the precision jobs. Make your own inserts to fit your particular job.
Four Standard Interchangeable Inserts Available for centered and uncentered work.

IDEAL

ETCHER-DEMAGNETIZER

Two tools in one! 14 Etching heats, 90 to 1350 watts. Cover removable for etching large parts. Demagnetizer has rating of 5.5 ampere. All parts enclosed when not in use.

IDEAL

ELECTRIC TACHOMETER

Checks RPM instantly. Used as "Hand Type" or with generator separated from meter as "Separable Type". Two types—0 to 2500 RPM, and 0 to 5000 RPM.

IDEAL Sycamore

★ IDEAL COMMUTATOR DRESSER CO ★

1441 PARK AVE., SYCAMORE, ILL.

Sales Offices in all Principal Cities.

In Canada; Irving Smith Ltd., Montreal, Quebec

CHIP BREAKER GRINDERS

The grinding of chip breakers in carbide tools, as a means of preventing formation of long continuous chips, is a process that will probably always have those to argue about the best practice.

Actually, if a man can get good results, it will be well to let him use his own method. He may break all chips so they do not exceed three or four turns in length, and yet not break them up so small so as to indicate too great pressure on the chip and the tool, which will tend to shorten the life of the carbide tool unduly. In too many places, supervisors forget that it is often difficult for one man to get results by using another man's method. So with chip breaker grinding.

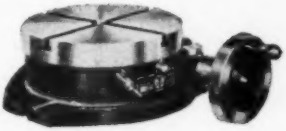
However, a good chip breaker grinder, fitted with a good diamond wheel for this purpose, will be a necessity in every case. Various machines made for this purpose are somewhat different in design. One has the vise in which tool is held for grinding, mounted on a ball-and-socket assembly on the machine base, so the vise can be set at the desired angle in each case.

The motor which has the arbor, carrying the diamond wheel, is arranged on a slide that is moved by means of a lever to carry the wheel across the work. This machine mounts on a bench.

Another machine adapted for chip breaker grinding has a table with an 11" longitudinal movement, and this table carries a swivel-mounted vise in which the tool to be ground is held. The addition of a tilting table attachment to this machine makes it capable of complete maintenance of carbide-tipped tools. The longitudinal movement of the table, being as long as it is, makes it a good machine for manufacturing operations of some kinds, as well.

A very interesting double-ended machine carries diamond wheels at both ends. One end is provided with a table adapted for the sharpening of carbide cutters.

BRAND NEW PRECISION ROTARY TABLES



9" — $ 97.00
12" — 160.00
15" — 185.00
18" — 220.00
18" — 350.00 HEAVY DUTY

OUR ROTARY TABLE WILL TAKE THE PLACE OF A COSTLY FIXTURE. IT IS USED FOR ALL KINDS OF WORK ON MILLING MACHINES, SHAPERS, DRILL PRESSES AND HORIZONTAL BORING MILLS.

WE CAN ALSO FURNISH DIVIDING ATTACHMENTS.

SEND FOR LITERATURE AND DETAILS.

FAST DELIVERY GUARANTEED.

Send for Literature of other tools.

LAFAYETTE TOOL & SUPPLY CO.

178 LAFAYETTE ST. NEW YORK, N. Y.

SLITTING SAWS
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LATHE MANDRELS
ACTUAL PHOTO OF TRU-CUT GOLD TIP BIT. 11/16" CUT. .020 FEED, 1020 SAE STEEL.
KEY SEAT CUTTERS

STANDARDS FROM STOCK

We mean just that! Immediate delivery assured through our vast manufacturing facilities.

WRITE FOR NEW CATALOG

Tru-Cut TOOL COMPANY

14236 Birwood, Detroit 4, Michigan

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Castolin Eutectic

EUTECTIC*
(Means Lowest Binding Alloy)
LOW TEMPERATURE
WELDING

NO GENERAL PREHEATING REQUIRED FOR WELDING CAST IRON

PROBLEM

How to repair this cast iron exhaust with a color matching, heat resistant weld? With high temperature, fusion welding there was great risk of stresses, new cracks, and distortion even in the hands of the most skillful welder. Bronze brazing could not be used since the job requires a perfect color match.

SOLUTION

Eutectic Low Temperature Welding Alloy No. 14 was tried. Its low binding temperature (950-1400°F) eliminated risk of stresses, new cracks, and distortion. Many jobs require only slight local preheat • Weld has high heat resistance • Easily machinable • Perfectly color matching.

* Reg. U. S. Pat. Off.

36 PAGE "KNOW-HOW" MANUAL "B" — WRITE TODAY!

EUTECTIC
WELDING ALLOYS COMPANY
Originators of the Low Temperature Welding Process
40 WORTH STREET, NEW YORK 13, N.Y.

Most of us probably are not aware of the extent to which round hole dies for drawing purposes have been made available in tungsten carbide. One manufacturer has them for drawing various sizes of bars and tubing up to 3½" in diameter. Such dies have been improved considerably of late, as well as being made available in an extended list of sizes.

The same firm makes various drawing dies of tungsten carbide for producing special shapes of bar and rods, including hexagonal, square, rectangular, half-round and other sections. The difficulties involved in finishing and servicing such special shape dies has led this company also to provide special equipment particularly designed for that purpose.

Three simple machines are involved, in addition to a hand polishing tool. There is an angle-lapping machine, a die-bearing sizing and finishing machine, and an adaptation of a small bench shaper for machining required sizes and shapes of laps. Laps are made of mild steel, and are used in combination with various grades of boron carbide or diamond powder for roughing and finishing dies.

Sheet metal drawing operations are a different proposition entirely, of course, but they also carry a great amount of importance and industrial interest. Various advances have been made during recent years to aid in the science of sheet metal drawing. One of these is the development of pneumatic die cushions which can be applied to punch presses.

DRAWING OPERATIONS

The coming of tungsten carbide has changed the wire drawing picture considerably, and we find the material being used in wire drawing dies, more and more. There are, of course, variations in tungsten carbides, not all of them are equally well adapted for a given line of work.

One firm is offering a special grade of tungsten carbide that is free from porosity, has great resistance to abrasion, and will take a high polish. It is finding extensive use for wire drawing and similar dies.

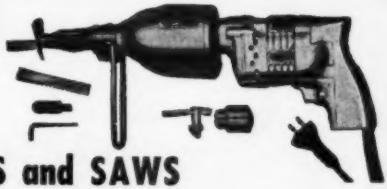
JANETTE SPEED REDUCERS

Your SLOW SPEED machines of from ***.08 r.p.m.*** and higher, ***1/50 to 10 H. P.,*** can be driven without using belts, pulleys, line shafts, chains, sprockets or slide rails, if you use one of the ***47 types*** of Janette speed reducers.

WRITE for our 100-page Catalog TODAY.

Janette Manufacturing Co
556-558 W. Monroe St
Chicago, Ill.

NEW SAW GUN



ONLY $42.00
QUICK SHIPMENTS ON AA-5 PRIORITY OR HIGHER

FILES and SAWS
Faster - Easier
DOES THE WORK OF SEVERAL TOOLS

★ Here's one of the greatest tools ever offered to industry . . . the New SAW-GUN. It does away with numerous time-consuming operations that formerly required several tools.

Attach the Saw-Gun to an electric drill, or propel it with compressed air or flexible shaft. Insert a broken hack saw blade and let 'er go. It will quickly saw light and heavy gauge metals, stainless or monel, corrugated or plain. A natural for panel notching in metal, wood and plastics. Reaches into spots impossible with any other tool. Filing operations are accomplished in the same manner.

It's portable . . . carry it quickly to the job. Automotive industries — metal and woodworking plants — in fact, any place where sawing or filing must be done — the Saw-Gun should be standard equipment.

Orders and re-orders from America's largest industries offer convincing proof that the Saw-Gun is indeed a great production tool. Sold on money-back guarantee.

See Your Jobber or Write Direct for Quick Delivery!

MID-STATES EQUIPMENT CO.
(Saw-Gun Division)
2435 So. Michigan Ave. Chicago, Illinois

countless cases, had a certain formula of gear steel in stock in round sizes ranging from 1 to 5". This particular steel is good not only for use in gears, however. It is recommended for use in the manufacture of arbors, ratchets, boring bars, fastenings, spindles, piston rods, and clutches, or in various other items where the ability to resist shock at relatively high hardness is a requirement.

Alloyed steels for die making are of special importance and interest. One of the basic requirements for such a steel is that it shall not deform to any appreciable degree during the hardening process.

Especially good results have been obtained along this line with certain air-hardening steels. One such, is handled by the heat treaters by heating it to somewhere within the 1750-1850 degrees F. range, and hardening it in air, then tempering to the desired hardness, usually from Rockwell C 58 to 64. It is said the material has shown remarkable resistance to abrasive wear.

There are, of course, a number of operatives that will demand an oil-hardening steel for die work, and who claim that an oil-hardening steel is to be preferred. Undoubtedly there are points in favor of either type of steel, and it is a certainty that excellent oil-hardening steels for this purpose are available from representative companies, in rounds, flats or squares. In hot-work dies, Stellite has often been the answer.

ALLOY STEELS

A tremendous subject in these days of advanced metallurgy, is that of alloy steels. It is one that is complicated not only by the many different formulae now closely charted by various steel companies, but also by making a specific formula available in the particular shapes that are best suited for machining with a minimum of trouble.

Considering gear steel as a case in point, it is a matter of record that one of the large steel companies with a reputation for providing just what is needed in

QUICK computation of angles and compound angles . . . **ACCURATE** to .001" or 1 minute of a degree . . . only **ONE SET-UP** of the work required! The Studler Angle Computer so simplifies layout of die work, survey of castings, and inspection of precision-machined parts that it does the work in one-half to one-tenth of the time required by the sine bar method. Simple to operate. Write today for Bulletin No. 2.

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30 years of oil cup experience

An interesting thing that has been noticed about one line of spot welders, is a variable pressure cycle between the electrodes, which goes far toward producing a superior job. There is an initial high precompression, which is provided for forcing parts close together to insure perfect contact. A reduced pressure follows, to provide the resistance for welding. This is followed by recompression, or a return to the initial high pressure, which mechanically forges the metal or drives it together to restore its original qualities.

One interesting spot welder made by the firm using this method is a portable type, fitted out with a radial arm.

Spot welders for aluminum have come into the limelight. It is interesting to know that one manufacturer of a line of welders has produced them in pedestal, rocker arm and gun types, specifically designed for the welding of aluminum. These welders are provided with refrigerated electrodes, which allow higher production, longer tip life, and insure weld consistency.

Incidentally, the spot welder is one of the places where compressed air is finding another use in the shop, for some models are air operated. One unit of this kind has been designed for the handling of aluminum and of stainless steel. It is made in voltages to meet special requirements when necessary. Air gages are included for controlling the pressure, and the electrodes are water cooled.

SPOT WELDERS

Spot welding technique has been improving thru the years and will probably continue to do so for some time. It does not pay to cling to antiquated equipment in any field, but perhaps it is less wise to do so in the case of a spot welder than in many other instances.

Neither does it pay to use an ordinary spot welder on some special kind of material, if it is handled in any considerable volume, when a welder for that particular material has been designed and built, with all of the peculiarities of that material in view.

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(Die Making Machine)

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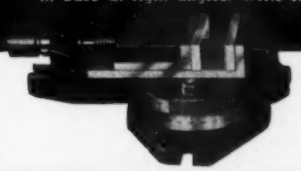
Modern Tools



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GAGING THE GRIND

In the last decade or two, remarkable things have been done in the matter of applying gages to grinding machines and equipment in order to maintain the proper size of parts, as well as applying gages by hand to work being ground.

Recently noted is an automatic diameter inspecting gage, which will caliper external cylindrical grinding jobs while the work is at rest or in motion. Such gages are readily installed on any cylindrical grinder, and one cannot unknowingly grind work undersize where they are used.

On a centerless grinder made by a builder of such machines, an automatic sizing device has been applied. It automatically compensates for wheel wear, and maintains the diameter of the work constant. An electric contact gage is used, and a closely adjusted gaging member is arranged so that when the diameter of the work increases by the slightest amount, due to the wear of the wheel, the work presses against this gaging member, and gives it a movement which causes an electrical contact to be made thru a small mercury switch. It is possible to adjust the gaging member mentioned so closely, that an increase in work diameter of 0.0001" will give sufficient actuation to cause the electrical contact to be made, and to close a circuit and compensate for the change.

The circuit, when closed, energizes a solenoid, and the solenoid operates a hydraulic valve, which in turn is arranged with auxiliary equipment to operate the in-feed slide screw by infinitesimal amounts. The arrangement is such that when the in-feed has operated to the point where the exact size of the work is restored, the electrical contact mentioned is broken, and the gaging member returns to its original position. It stands guard against any further developing oversize of work.

An interesting electrical sizing device has also been developed for application to a line of chucking grinders. This cannot be described in detail here. A carbon washer and a sizing ring are employed.

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THAT WILL SPEED UP YOUR FINISHING

In scores of America's busiest war plants Yeomans Rotary tools are throwing off clean sharp chips. They are biting into castings in a hurry. They are doing an A-1 job of speeding production of a tremendous variety of metal parts and castings. Yeomans tools—and Yeomans regrinding service for your Burrs, Diesinkers, Reamers, Drills, End-mills and Milling Cutters can help you speed your production. Write today for complete facts.

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PALMGREN Heavy Duty Angle Vises are built sturdy and rugged for tough, heavy jobs. They are accurately graduated in degrees, can be quickly adjusted to any angle, stay locked under severe service and save valuable hours otherwise wasted in tedious make-ready, wedging or making temporary jigs and fixtures.

Jaws are hardened and ground. Special outstanding features are the size and opening of jaws—4" Jaws open full 4"; the 6" Jaws open full 6" etc., with corresponding depth of Jaws. Vise can be used as ordinary vise when lowered to horizontal position. Swivel bases furnished if desired. Sizes 4", 6" and 8" Jaws and openings. Prompt deliveries.

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PRECISION WORK AT ANY ANGLE

IN-PLANT FEEDING

Action to promote the establishment of suitable in-plant feeding facilities for war industry workers was announced recently by Donald M. Nelson, Chairman of WPB, citing these points:

Experience shows that better nutrition among industrial workers promotes productive efficiency, whereas inability to obtain enough good food in many cases has lowered productivity by causing excessive fatigue, accidents, absence from work and turnover.

One of the most efficient ways to improve the nutrition of civilian war workers is in-plant feeding. This has been demonstrated in many American factories where, even in peacetime, canteen or cafeteria service was provided for employees.

The need for such service has increased rapidly. In many places, vastly increased employment on a two or three shift basis has overtaxed the ability of the few neighboring shops to serve suitable food to large numbers of workers during their brief mid-shift meal period. So many wives have joined the war workers that it is increasingly difficult for workers to rely on the old-fashioned lunch box.

For these and other reasons, millions of American war workers must look to plant canteens or cafeterias to obtain the warm and substantial meals to sustain physical effort required in war industry.

Managements of war industries are requested to arrange to provide or improve in-plant feeding facilities if adequate provision does not already exist to care for the needs of their workers.

WPB officials commented that the in-plant feeding programs have been urged by labor groups and managements as one of the most necessary steps to minimize absenteeism and turnover and to improve health and safety. Feeding programs have been a part of the joint effort of labor-management committees in many war plants. Fatigue caused by long hours of work with insufficient or unsuitable food has become one of the heaviest factors in retarding production.

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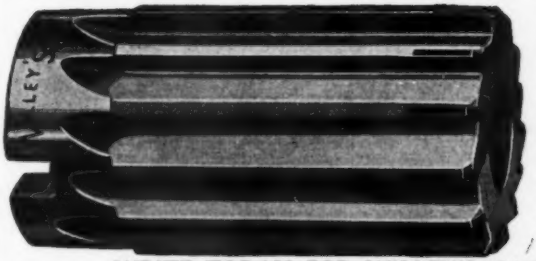

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BLANKING DIES

The method by which a blanking die will be made, as well as material of which it will be constructed, is being based more and more on the amount of work the die will be expected to do, and the severity of that work. There is no good point served in putting a great deal of money into a die when there is no reason to believe it will yield a greater return than one of cheaper construction.

One die-making firm is producing blanking and piercing dies by a so-called template method. The dies are laid off from templates of the parts which are to be produced; are contour-sawed, then filed, after which they are hardened and welded to back plates of inexpensive material. They are fitted with small rubber blocks cemented in place to make them self-stripping and self-ejecting, and make a good layout for a low-cost die, being available for single, compound or progressive operations.

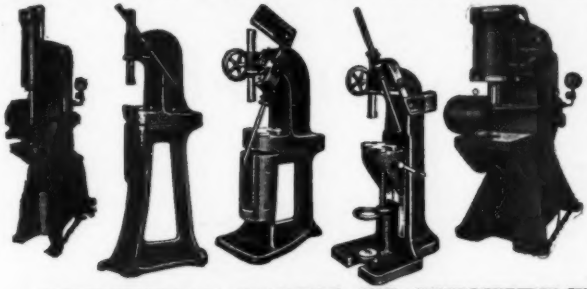
Special tool steels suitable for blanking dies are available from some steel firms, cast to the approximate shape that will be required in the die. There is an air-hardening tool steel known as Kinite, for instance, that is furnished in this manner.

One such casting has a round center opening, which, after being machined and ground, is used for blanking can tops for a can company. But cast shapes from this steel are not limited to simple round patterns. The most intricate patterns often can be satisfactorily cast so that only a small amount of metal must be removed in machining the die.

Round opening dies are used frequently, since there are various circular parts to be blanked. Sometimes only a ring is prepared for a blanking die. Such round parts can be ground to advantage in many cases on a lathe, using small grinders that have been designed and built for use in connection with the lathe.

Some companies make a considerable saving on their blanking die layouts by using some of the arc welding electrodes that have been designed for depositing, so they can be ground later.

For AIRCRAFT and MUNITIONS



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Sliding boxes which swivel on the adjusting screws enable the operator to adjust the abrasive belt easily and to change it quickly. Gauge and Dust Hood hinged to open quickly for belt removal.

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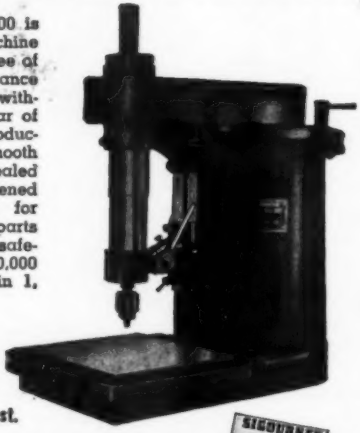

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DIE SINKING

As a general rule, when die sinking machines are mentioned, it calls to mind equipment much on the order of vertical milling machines. The principal difference is that they are heavier machines capable of withstanding heavy side thrust on the cutters, and in some cases fitted with profiling attachments that can be used for duplicating dies or molds already existing. Therefore, it is not surprising that some of the leading builders of milling machines should also provide die sinkers.

Some die sinking and profiling machines are on the market which will cut dies and molds in a third dimensional direction, as well as handling flat work. All of the motions on these machines may be automatically controlled, or they may be semi-automatic, if preferred. They are convenient on work that is more complex than ordinary.

One of the important points overlooked by die sinker operators of limited experience is the importance of the cutters. Quality cutters must be used for good results, and to put quality into a die-sinking cutter requires a very close knowledge of the factors that have to do with their successful operation.

Some of the manufacturers of twist drills and similar tools make excellent die sinking cutters. There are those who manufacture both machines and small tools that furnish complete lines. One of these provides die sinking machines in addition to die sinking cutters.

A popular line of die sinking machines has an unusually effective system of controls. These machines are built for heavy, rugged cuts. One unit in particular has a handwheel at either end of the worktable for longitudinal hand traverse, and another wheel at the center-length of table for hand cross traverse. In addition, there are levers to engage the power feed for either longitudinal table movement or for cross motion in either direction. Rotary table attachments can be applied.

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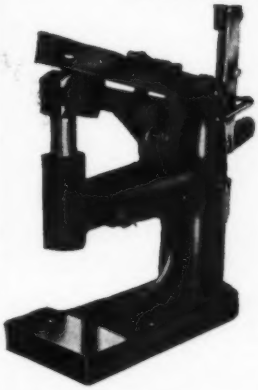

Outperforms conventional Riveters on numerous jobs.

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Uniform blow of hammer makes it ideal for riveting movable joints; can be quickly and easily adjusted for various jobs.

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	1	1-B	2
Stroke	2"	2"	2½"
Spindle	1"	1"	1¼"
Throat Depth	4¾"	4¾"	8½"

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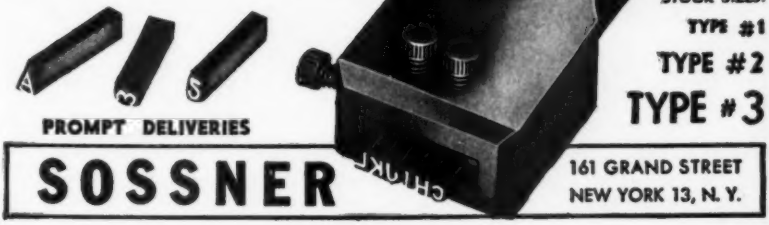

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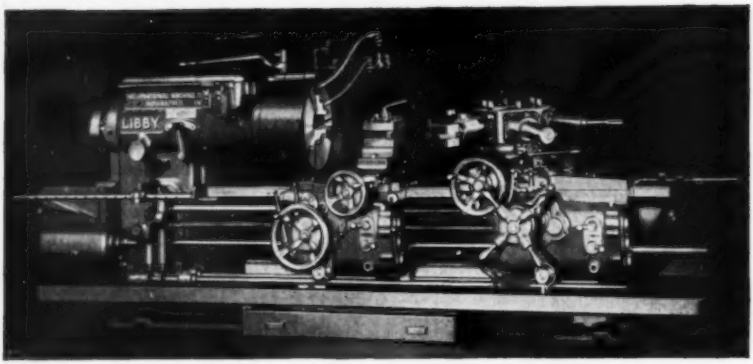

A new line of Libby Type H Heavy Duty Turret Lathes incorporates new features and standardizes on sizes for both the regular line of Heavy Duty Turret Lathes and Fixed Bed and Sliding Bed Type machines. These machines are built by International Machine Tool Corp., Libby Div., Indianapolis, Ind.

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Its price of $70.00 is much less than a steel or cast iron plate of comparable quality; deliveries are prompt.

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Gap Turret Lathes, three standard sizes of Sliding Bed Gap Turret Lathes and special Heavy Duty Turret Lathes to suit any set of special requirements.

Spindle control is by a lever on headstock which operates clutch and spindle brake simultaneously.

Speed selection is controlled by three levers. One lever divides the eight speeds into two groups, four high and four low, which in turn are divided into two groups of two speeds by another lever. The third lever at front of headstock selects the particular range desired. In center position, gear train is free, permitting manual rotation of spindle for making setups.

Motor has NEMA Type B flange mounting with a special shaft extension and driving pinion is mounted directly on motorshaft. Motors are regularly furnished for 1500 or 1800 rpm and with required electrical characteristics.

Headstock transmission provides eight spindle feeds; however, 16 speeds are obtainable with a two speed, 1800-900 rpm motor. A rheostat and DC voltage motor will give a variable speed range. A combination disc and cone clutch provides smooth engagement with no slippage at all spindle speeds.

Spindle is mounted on four precision tapered roller, anti-friction bearings; two at either end, carrying both radial and thrust loads. All other shafts are mounted on large selected anti-friction ball bearings.

Feeds in the apron are rapid traverse and independent of each other. Eight reversible feeds are provided for each of the nine positions of lever on selective gear box which makes a total of 72 feed changes from .007″ to .500″. This provides proper feeds for cutting all standard threads including 7½ and 11½. A special feed range of .0019″ to .125″ may be furnished. Feed changes are obtained by rotating dial on lower left side of apron to A, B, C, or D position and by shifting clutch lever to left or right for coarse or fine feed. Fine position furnishes one-eighth the feed obtained with lever in coarse position. All longitudinal or cross feeds are reversed by throwing forward reverse clutch lever to left or right. Longitudinal power feed is obtained by locking hand wheel, causing lead screw nut to revolve about stationary lead screw. This provides a steady, smooth feed while holding tools positively to work. Feed is engaged by a lever and may be manually disengaged by tripping latch lever.

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No. 208 (left) Approximately 15 gal. capacity P.M. Tank 20"x16"x 16". ¼ H.P. motor. For grinding machines, multiple spindle drills. $98.50 each for the 110 volt, 1 phase model, and 220 volt, 3 phase model. $112.00 for the 550 volt, 3 phase model. No. 1-s (right) Approximately 7 gal. capacity P.M. 16"x10"x 11" tank. ¼ H.P. motor. For Milling and Screw Machines, Lathes, etc. $98.50 each for 110 volt, 1 phase model, 220 volt, 3 phase model. 550 volt, 3 phase model $108.50.

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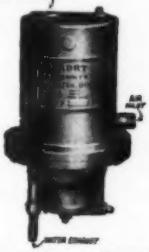

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KUTMORE HIGH SPEED ADJUSTABLE HOLLOW MILLS

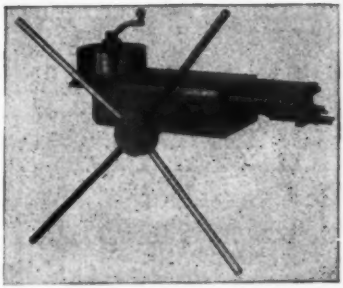
16 standard sizes—Cutting capacities 1/32" to 2". Also specials made to order.

The KUTMORE is the only hollow mill with built-in micrometer dial adjustment. Prompt delivery — even on specials. *Write for Catalog No.* 15.

CARL WIRTH & SON, 1625 Clinton Ave., N, Rochester 5, N. Y.

New! **How to Convert Engine Lathes Into *Screw Machines!***

TURRET ATTACHMENT



Make your engine lathes do double duty by equipping them with Turret Attachments. Converts an engine lathe into a hand screw machine in 15 minutes—and vice versa—at a fraction of the cost of a new screw machine. Installed on the ways by simply removing tail-stock.

Fits Any Make Engine Lathe

A variety of models to fit any size and make of engine lathe. Six-station turret with automatic stops. Self-indexing to position. Adjustable screw stops. Write for full information on turret attachment, collet chucks and cross-slides — also 64-page catalog of standard cutting tools.

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UNITED INDUSTRIES
8344 SECOND BOULEVARD, DETROIT 2, MICHIGAN

Increase **YOUR RIVETING PRODUCTION**

WITH **GRANT RIVETERS**

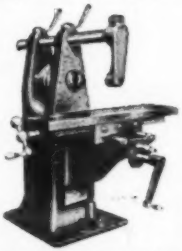
A great help in War Production, these GRANT Riveters are available in Noiseless Spinning and Vibrating Hammer types. Also Vertical and Horizontal Multiple Spindle Spinning Machines.

Write For Details.

GRANT MANUFACTURING & MACHINE CO.
C E Station, Bridgeport, Conn.

***ARE YOU* Milling Keyways Dovetails — Cutting Special Shapes?**

If you are performing any of a hundred or more small milling operations—in manufacturing or toolmaking—this Lewis Bench Mill can save you money!



Furnished as either plain or semi-finished castings—with materials and blueprints—it can be quickly finished and set up for fast accurate milling on jobs where more costly machines are unnecessary.

Exceptionally large table movements for its compact size greatly increase versatility of this Mill. Low initial cost and efficient operation effect additional savings. Priorities are low, shipments can be made from stock—further details are yours for the asking—write TODAY!

Lewis MACHINE TOOL CO.
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Castings FOR THE TOOL BUILDER

P. O. Box 116, Station A, Los Angeles 31, Calif.

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BALL BEARING GRINDERS

STURDY BUILT
for Long, Hard Service

ASK FOR BULLETINS
ON COMPLETE LINE

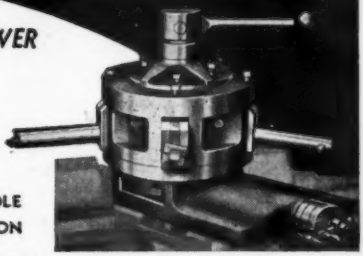
Above: Baldor Special Carbide Tool Grinder, ½ h. p. ball-bearing motor, 6" Silicon Carbide wheels, $95.00
Ask for Bulletin 305;

At left: BALDOR Grinder No. 101, 1½ h.p., ball-bearing motor; 1725 r. p. m., 220 volts, 3- phase, 60 cy; $90.00
10" Alozite wheels.
(Ask for Bulletin 307).

BALDOR ELECTRIC COMPANY
4368 Duncan Ave., St. Louis, Mo.

STOP WANT TO SAVE TIME?

HERE IS THE ANSWER



Our NEW IMPROVED
5 STATION LATHE TURRETS

1. JUST A TURN AND A LIFT OF THE HANDLE BRINGS ONE OF FIVE TOOLS IN POSITION
2. THIS, WITH TEN ACCURATE INDEXED TOOL POSITIONS ALLOWED MINUTE ADJUSTMENTS

Time saved brings VICTORY that much nearer. Our NEW IMPROVED TURRET HEADS are built to take heavy cuts, and give precision service. Inexperienced help can quickly become fast operators with these NEW IMPROVED TURRET HEADS.

MADE UP IN FOUR INDIVIDUAL SIZES
FOR LATHES FROM 9" to 30" SWING

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132 CHARLES STREET. AUBURNDALE, MASS.

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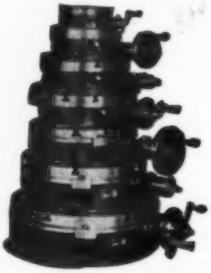


Sizes 9', 12', 15' and 18'.
Ask your dealer or write us for eight page catalog.

ALFRED A. TROYKE
4422 Appleton St., Cincinnati, O.

Machine uses No. 5-C Hardt Collet — a popular size which many plants now have. Has single lever control—starts-stops-applies brake, opens and closes collet.

Has 4-step V-Belt Drive—Threaded nose spindle for use of 4" 3-Jaw universal chuck—

Send for complete Bulletin.

REYNOLDS
MACHINERY CO.
211 EDDY STREET PROVIDENCE R. I.

MASTER CHECKING ROLLS

Sav-Way Industries, Box 117, Harper Station, Detroit, Mich. announce an important contribution to precision control—a set of master setting and checking rolls for checking micrometers, snap gages and other precision inspection and gaging instruments used in aircraft and ordnance work.

It consists of 20 individual rolls ranging from .100 to 2.000" in diameter. The rolls are hardened, ground, and lapped to gage makers' X tolerance. They are deep frozen before finish grinding to eliminate internal strains and provide accelerated ageing.

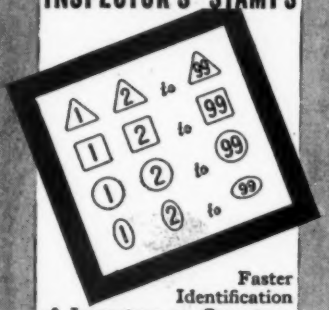
The makers emphasize that when micrometer anvils have become unevenly worn by long use on one type of work, checking with flat gage blocks is not adequate, as only the high points of the anvils come in contact with the blocks. This method of checking will obviously result in an inaccurate reading when the micrometer is subsequently used on round work.

Improper checks may also occur when a micrometer has had long use thru one particular part of its range so that one section of the barrel is worn more than other sections. In this case, checking the micrometer thru any one part of its range might show it accurate, while actually the instrument might be out considerably at the point of greatest wear. These setting and checking rolls provide a means of making 20 quick, accurate checks thruout the entire range of the instrument at one time.

In addition to checking, the rolls are useful in setting up jobs where dial indicators and amplifiers are to be used.

New

INSPECTOR'S STAMPS



Faster Identification of Inspectors or Operators. Different borders may be used for different shifts. Available in 4 sizes. Write for prices today.

NEW METHOD STEEL STAMPS, Inc.
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ALMOND

TRIPLE JAW DRILL CHUCK

SINCE 1872

ALMOND Three Jaw Drill Chucks are widely used for holding drills, taps, reamers and other tools, and are always used in connection with and by being mounted upon some m of machine tool such as drill press, lathe, or milling machine. Also used on portable tools, principally electric and pneumatic drills.

ALMOND Three Jaw Drill Chucks were the first to be placed on the market; they are the pioneers of the field. These years of research and top material going into their production have made them outstanding in the field.

WRITE FOR DETAILS

T. R. ALMOND CO.
ASHBURNHAM, MASS., U.S.A.

Mark It Quickly *with a* NUMBERALL

Made with 1 to 20 wheels. Stamp in perfect alignment. Shank for Hand or Press Stamping. Platform for stamping Name Plates and other small articles.

No. 45 Platform

NEW Quick Set Machine. One wheel can be turned quickly by knurled knob for consecutive numbering.

NUMBERALL STAMP & TOOL CO.
Huguenot Park, Staten Island 12, N.Y.

The set is housed in a modern transparent plastic case which provides protection and also gives a clear view of the contents. The price is said to be so modest that one or more units is an incidental purchase for even the smallest shop. An illustrated instruction booklet on The Use and Maintenance of Micrometers is available.

SUNDSTRAND NO. 33 FLUID-SCREW RIGIDMIL

Bulletin No. 33-1, describing their new model 33 has recently been issued by Sundstrand Machine Tool Co., 2535 - 11th St., Rockford, Ill. This 18 page folder contains a description of the fluid screw principle, and mentions a number of outstanding features of their Rigidmil. These include automatic lubrication; range of spindle speeds in a 30:1 ratio, speed feed and speed motor; square type table ways; unit construction; easy chip removal; and automatically controlled table cycles. A number of floor plans showing typical installations of the machines appear in the bulletin.

DILLON TENSILE TESTER

The Model B, a new and versatile portable tensile testing machine, has been introduced by W. C. Dillon & Co., Inc., 5410 W. Harrison St., Chicago, Ill. Altho only 32" high and weighing 83 lbs., the new tester will make all types of stress (and some compression) tests up to 10,000

ANOTHER HIGH PRODUCTION SPECIAL MACHINE by ADVANCE

Designers and Builders of High Production Special Machinery. Let us have your Inquiry.

The MACHINE ILLUSTRATED

is a Double-End Hydraulic Machine equipped with Trunnion type index fixture for DRILLING . . . ROUGH BORING . . . FINISH REAMING . . . UNDERCUTTING . . . Piston-Pin Hole in piston . . . Two complete pistons in one pass.

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THREAD GRINDING

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MANUFACTURERS OF
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GIRLS CAN OPERATE

NEW Rouse
HAND MILLER
FOR SMALL PARTS

$98
(Without Fixtures)
F. O. B. Chicago
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One of the ROUSE Fixture Set-Ups that Speed Production

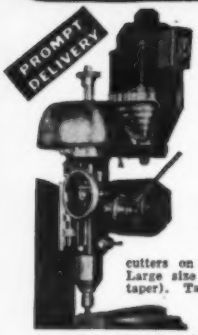
The Rouse Hand Miller is a versatile, efficient, high-speed ball bearing machine for handling light cuts in brass, aluminum and steel.

Rouse Fixture Set-Ups make the Rouse Hand Miller readily adaptable for accurately milling small parts for planes, radios, electric motors, and similar equipment. Spindle will take milling cutters or end mills.

Prompt delivery can be made. Send for circular.

H. B. ROUSE & COMPANY
2214 N. Wayne Ave., Chicago 14, Illinois

MILLING - DRILLING - BORING
ATTACHMENT for Heavy Duty Operations



Easy Mounting
Large Quill — 4" travel
counter balanced, hardened, and ground
6 speeds
250 - 3000 RPM
Lever and Worm Feeds
½ H.P. Motor

Specially engineered by RUSNOK to meet the demand for heavier duty end mill operations. Uses many types of cutters on a wide range of work. Large size spindle (No. 9 B & S taper). Takes 1/16" to ¾" end mills. Precision Engineered and Ruggedly Constructed Throughout.

Write for descriptive folder.

RUSNOK TOOL WORKS
4840 North Avenue, Chicago, Ill.

NUMBERALL

Improved Type Holders for Hand or Press Use. Super Quality Steel Type for Stamping into Metal, etc.

Write for Circular to

NUMBERALL STAMP & TOOL CO.
Huguenot Park, Staten Island 12, N. Y.

pounds. There are seven available capacities, starting at 0 to 250 pounds.

Makers emphasize that this model makes available, a small tester with many features of the larger and less handy models. This includes:—large specimen space, pull exerted, fast operation, portability, extremely rugged, accurate, and direct reading dial, and max. hand. This is accomplished by use of the Dillon AN Dynamometer, which serves many branches of industry and the war effort.

The model has been selected by major war plants, to test metal coupons, parachute clips, aircraft parts, weld specimens, etc. Standard grips are included for flat stock, and special grips can be had for rubber, paper, wire, etc. or for specially shaped production pieces.

ADJUSTABLE FLY CUTTERS

SUPPLEMENTING their line of "CC" Adjustable Cutting Tools, the Robert H. Clark Co., 3424 Sunset Boulevard, Los Angeles, Cal., announces the new Clark Fly Cutters for cutting holes, wheels, or discs in thicknesses up to one inch (2" on reversible work) in wood, boiler plate, stainless steel, cast iron, plastics, and other "problem" materials. Some important innovations are claimed for this tool by the manufacturer:— (1) Generous clearance between work and the body of this Fly Cutter makes possible deeper cuts with less strain on the tool; (2) The new cutting technique eliminates chatter and assures clean holes.

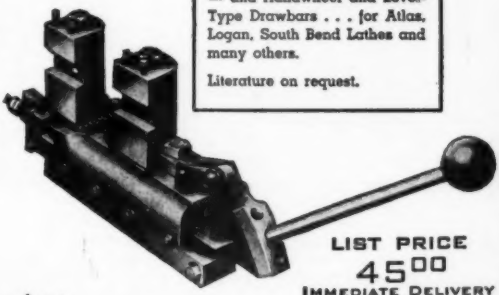
THE NEW *Precision* LEVER TYPE CROSS-SLIDE

- **Equipped with sensational tool leveling adjustment — Maintains tool in absolutely horizontal position.**

A sturdily constructed job, the *Precision* Lever Type CROSS-SLIDE has a capacity of 2½". Built into it are many important features not usually found in a single unit . . . Three separate models fitting ATLAS, LOGAN, 9" SOUTH BEND Lathes. Can also be adjusted to any other bench lathes.

Your dealer can supply you with the new *Precision* lathe attachments. Also ask him for *Precision* Collet Models 3AT, 3C, 5C, 480 (Same as W. & S. No. 1) — and Handwheel and Lever-Type Drawbars . . . for Atlas, Logan, South Bend Lathes and many others.

Literature on request.



Precision Collets and Drawbars

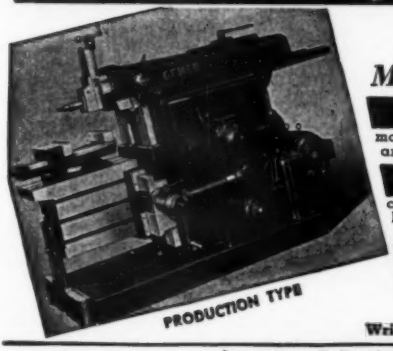
LIST PRICE 45.00

IMMEDIATE DELIVERY FROM STOCK

GENERAL DIE-STAMPING-TOOL COMPANY

PRECISION COLLET DIVISION. 265 Canal Street, New York 13, N.Y.

Matched for the Job!



PRODUCTION TYPE

GEMCO

Multi-Purpose SHAPERS

PLAIN TYPE A fast utility machine for a wide variety of the average shop work and for training purposes in industrial schools.

PRODUCTION TYPE Massively constructed with a large table to handle medium heavy work on a peak production basis with high limits of accuracy

UNIVERSAL TYPE Ideal for tool and die work, experimental laboratories and model shops or where angular work set-ups are required.

Write for illustrated bulletin GC-12H.

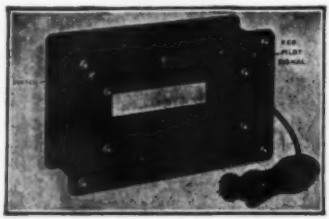
Immediate Deliveries on Firm Orders!

GENERAL ENGINEERING & MFG. CO.

ST. LOUIS 4, MISSOURI

Manufacturers of Precision Equipment SINCE 1917

AMC DEMAGNETIZER
A TOOL ROOM NECESSITY



Every tool room needs this simple, portable, sturdy demagnetizer. Small parts passed through the powerful AMC field are instantly demagnetized. Large, flat surfaces can be demagnetized by sliding the device over the surface.

Price is only $32.50, complete as shown.

Write for full information.

ALOFS MFG. CO., Grand Rapids, Mich.

Gusher
COOLANT PUMPS

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Made in various types and sizes from 1/30 to 2 H.P. Pumping capacity up to 200 g. p. m. Many patented and exclusive features.

THE RUTHMAN MACHINERY CO.
1808 Reading Rd. Cincinnati, Ohio

We have an opening for a first-class designer of small tools such as Die Heads and Taps. If you are looking for a good opportunity please give full particulars regarding experience, age and salary expected.

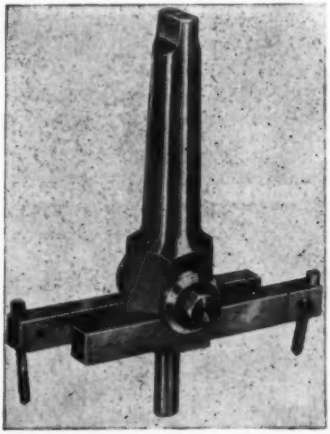
Address replies to: Box B-6

c/o HITCHCOCK PUBLISHING CO.
542 S. Dearborn St. Chicago 5, Ill.

The Tool shown, is obtainable with straight or tapered shank in sizes to cover expansions of 2½ to 10" in diameter, including all decimal or fractional intermediate sizes.

With these additions to the "CC" Adjustable Hole Cutter line, the manufacturers have provided tools for cutting holes from ⅝ to 10" in diameter and straight side discs from 2½ to 10" in diameter.

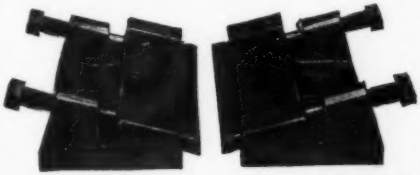
Models for cutting diameters from ⅝ to 5", and for cutting holes in pipe and curved surfaces, have 3 cutting blades. Those for cutting diameters from 2½ to 10" are of two blade Fly Cutter type as illustrated.



The "CC" line also includes a new adjustable surface facing tool of special interest to shops which cannot justify maintaining a full line of expensive high-speed end mills and angle cutters. Production is in four models, expansion capacity of the four being from one to five inches.

The bits in all of the tools can be reground easily or can be replaced with new bits at comparatively small cost, thus lengthening the life of the tools indefinitely. According to the manufacturer, prompt shipments are now being made on suitable priorities. New Bulletins are available giving full information.

HART'S Divided Machine Vises



These Vises will hold work the full length of the table, if necessary. Useful on planer, milling machine, surface grinder or drill. They adapt themselves to any shape and can be used on sides of table as well as ends. The jaws are tool steel and hardened, the angle holding the work down on the table.

HART'S Milling Fixtures

These fixtures will make themselves popular and profitable in your shop. Easily kept clean to receive the work. May be used in either horizontal or vertical position. Suitable to hold round, hexagonal, octagonal, or square stock, aligning the work with the machine. Grip holds the work on the bottom as well as on the back. Shipped in pairs, unless otherwise ordered. Made in 4 sizes—¾" to 4".

HART MACHINE CO.
26 MATHER ST., DORCHESTER, BOSTON, MASS.

When writing for descriptive circular kindly mention the BLUE BOOK.

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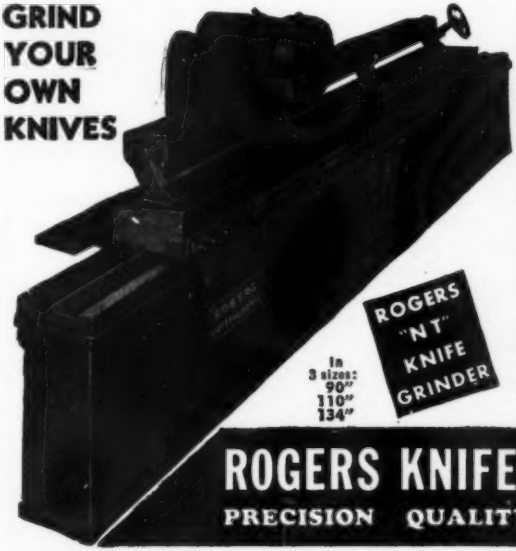


In 3 sizes: 90" 110" 134"

KNIVES LAST LONGER . . .

when sharpened on this modern, cabinet-base type ROGERS grinder. Precision controls assure **keenest edges,** with minimum removal of metal. Grinds any straight knife on edge or face; any bevel; flat or concave.

Reasonable shipments. Send for Circular NT and give maximum length of knives.

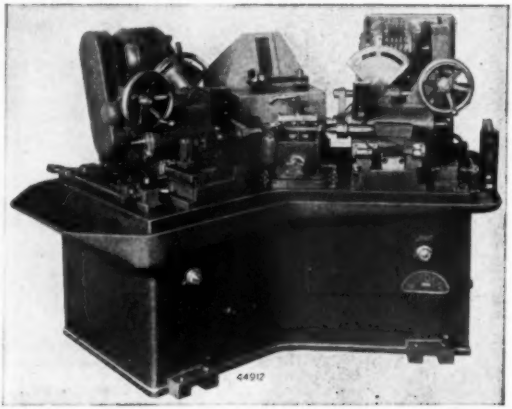
SAMUEL C. ROGERS & CO.
297 Dutton Ave., Buffalo 11, N. Y.
Also manufacturers of circular knife, circular saw and band saw sharpening equipment.

ROGERS KNIFE GRINDERS

PRECISION QUALITY SINCE 1887

SEMI-AUTOMATIC WEIGHING AND BALANCE-MILLING OF CONNECTING RODS

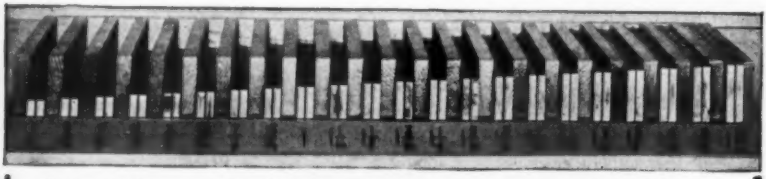
Incorporating several unique features said to mark an advance in weighing and balance milling connecting rods for internal combustion engines, is this development, announced by Snyder Tool & Engineering Co., Detroit.



In operation, a small amount of excess stock is left on each end of the forging. By milling into this metal, excess weight is accurately removed.

Workpiece first is weighed and excess stock on each end determined with a double dial shadowgraph scale.

Piece is then clamped in fixture manually, and, by turning a hand wheel, operator advances a finder which locates excess metal and immediately flashes on a green tell-tale light. This operation automatically brings cutting tool into alignment with tip of



Attention: Tool Supervisor **Compare Price and Accuracy**

ANTON PARALLELS

Hardened and Ground

Width ¼"	Length 6"	
Accuracy	Within .0001" in parallelism and straightness on ground sides	Sold to consumers only
Depth of Hardness	About .040"	
Hardness	Rockwell C 64 ± 4	

COMPLETE SET OF 22 PAIRS from ½" to 1-13/16" in height in steps of 1/16", with case, as illustrated, $85.—net, F. O. B. New York, N. Y.

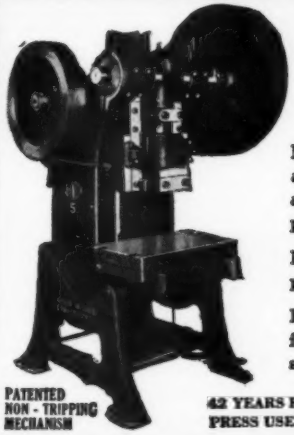
Sold in complete sets only and ON MONEY BACK GUARANTEE

THE MOST IDEAL SET OF PARALLELS WHICH SHOULD BE IN EVERY TOOLROOM AND INSPECTION DEPARTMENT

IMMEDIATE DELIVERY ON HIGH PRIORITY.

EASTERN MACHINE AND TOOL COMPANY

170 Broadway Tel. COrtlandt 7-3579 New York 7, N. Y.



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Much larger die space than average presses. Engineered and designed for unlimited peak production.

Reinforced construction at points of greatest wear.

If you want the best, send for illustrated catalog describing complete line TODAY.

With Modern JOHNSON POWER PRESSES

PATENTED NON-TRIPPING MECHANISM

42 YEARS ENGINEERING EXPERIENCE BUILT INTO EVERY JOHNSON PRESS USED BY LEADING MFR'S. THROUGHOUT THE WORLD.

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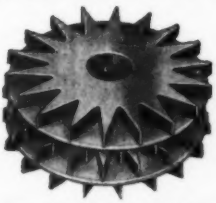
DESMOND
GRINDING WHEEL DRESSERS and CUTTERS



We can supply you with the proper Dressers and Cutters for all of your grinding wheels.

Ask for copy of our catalog and name of your nearest dealer.

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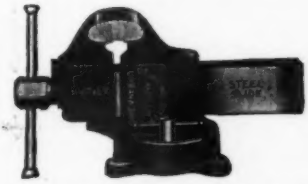
Steel Slide VISES



A full line of Machinists' Filers, Welders, Production and Drill Press and Milling Machine Vises.

Let us send you our vise catalog and name of your nearest dealer.

ARMY-NAVY

THE DESMOND-STEPHAN MFG. CO.

URBANA • OHIO

finder. Should operator turn wheel too far, a red light flashes until wheel is reversed to bring tool back into alignment.

Operator then sets pointer on fan-shaped dial (above milling unit) at the amount of excess stock which the scale indicated. This sets cutter in position to remove that excess.

When these settings are made for each end of connecting rod, push button is pressed, and both units feed cutters past work, removing excess stock and bringing rod to correct balanced weight within the usual quarter-ounce limit.

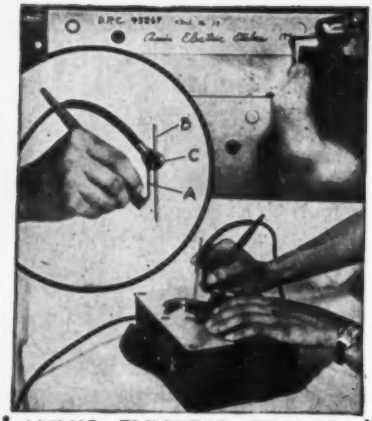
The machine shown is designed for handling one connecting rod. Distance between centers in the large and small pin holes is fixed. However, by providing suitable adjustors on scale and fixture, two or more connecting rods of various lengths and weights can be balance-milled on a machine of this type.

Among the unique features is the use of lights to indicate accuracy in locating stock to be removed. An excess adjustment of as little as .002" causes red light to flash on and warns operator to retract his adjustment until only the green light remains lighted.

DE-STA-CO. TOGGLE CLAMPS

Bulletin No. 43 has been issued by Detroit Stamping Co., 347 Midland Ave., Detroit, 3, Mich. It describes the use of their product for clamping parts in fixtures, for machining, drilling, reaming, welding, or assembly operations. They state that jigs and fixtures designed to use toggle clamps are made better, for less cost, in less time, and will increase production per hour. It is claimed that because the work bars on their clamps are of one piece of solid steel, there is no danger of separating under heat of welding.

The bulletin includes prices on arbor spacers and shims, and may be had on request.



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(for precision work)
with the stylus that stays cool
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RED HEAD
ETCHERS and DEMAGNETIZERS
Let us tell you the many advantages of our new D. C. and A. C. models now available. Also, see our new line of Midget Chucks.
Send TODAY for latest circulars
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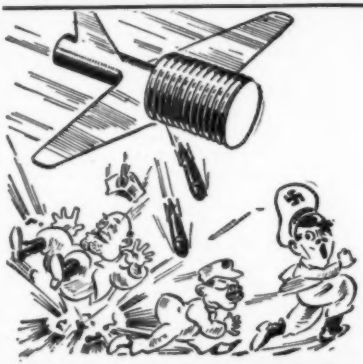
★ CENTERLESS GRINDING
Straight Cylindrical, Shoulder, Profile, and Multiple Diameters . . . Long Bar Grinding . . . Ground Taper Pins and Dowel Pins.
Screw machine products. Heat treated and ground if necessary. Improved and expanded facilities assure prompt and accurate service.
Send your blue prints or samples for estimates.
PORTER MACHINE COMPANY
3100 Enyart Ave., Oakley, Cincinnati, O.

ONE DOWN and TWO TO GET!



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are Doing Their Part

THREAD PLUGS
THREAD RINGS
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SNAP—PROFILE
CONCENTRICITY and
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JIGS and
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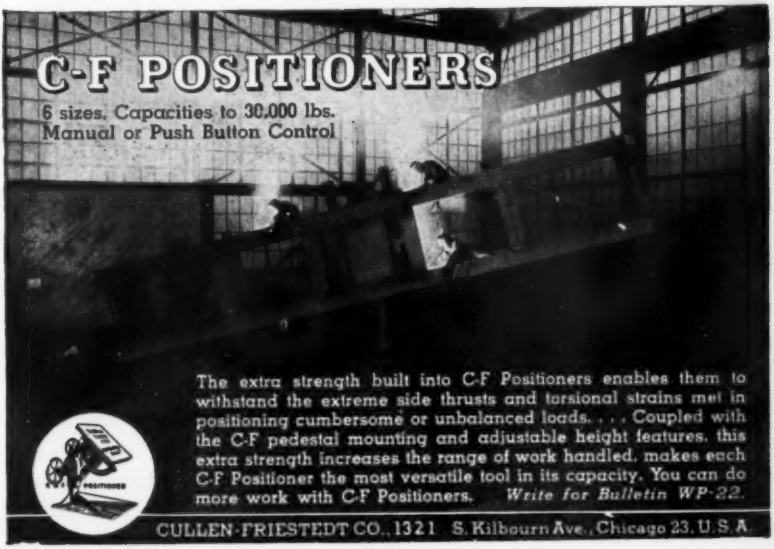
2210 Fenkell Avenue Phone University 3-7676 Detroit 21, Michigan


C-F POSITIONERS
6 sizes. Capacities to 30,000 lbs.
Manual or Push Button Control
The extra strength built into C-F Positioners enables them to withstand the extreme side thrusts and torsional strains met in positioning cumbersome or unbalanced loads. . . . Coupled with the C-F pedestal mounting and adjustable height features, this extra strength increases the range of work handled, makes each C-F Positioner the most versatile tool in its capacity. You can do more work with C-F Positioners. Write for Bulletin WP-22.
CULLEN-FRIESTEDT CO., 1321 S. Kilbourn Ave., Chicago 23, U.S.A.

MILLING CUTTER BODIES

To facilitate the application of the correct milling cutter to a particular piece of work, Farrel-Birmingham Co., Inc., Ansonia, Conn., has developed milling cutter bodies of Meehanite which can be machined for carbide or cast alloy tips within a broad range of rake and spiral angles.

A variety of body castings and cutting tips can be kept in stock by machine shops to use in making up cutters for many applications. The user faces, bores and slots the hub to suit his requirements, mills the tooth seats, and brazes on the desired tips. Carbide tips may be applied where a high grade finish is required and cast alloy tips used for heavy roughing operations. Illustration on the left shows finished cutter with brazed-on carbide tips. Right, cutter body casting.

Because the bodies are made of Meehanite, which has greater damping capacity than steel, it is claimed that operating speeds can be higher, chatter is reduced and tip life prolonged. It is pointed out that Meehanite has a coefficient of expansion closer than steel to that of carbide. This helps to make a superior bond between body and tip. Meehanite is a relatively inexpensive and readily available metal and its use releases other scarcer materials more urgently needed for war purposes.

PLANNING FOR PEACE

An attractive new 12-page brochure, has been published by the Fostoria Pressed Steel Corp., Fostoria, O. It points out that post-war planning committees see the danger of not looking ahead, and believe that a middle-of-the-road plan is logical. This would permit industry to produce materials urgently needed today, and yet tie their production and sales operations more definitely with tomorrow. The brochure illustrates how Near infrared equipment has fitted itself to peace and war-time operations.

MATERIAL HANDLING EQUIPMENT

Circular No. 134, describing their handling equipment, has been issued by Lyon-Raymond Corp., 1380 Madison St., Greene, N. Y. It includes descriptions and illustrations of their lift, pallet, die handling, sheet handling and hoisting trucks. Also mentioned are their elevating platforms, hydraulic pumps, aircraft production and servicing equipment.

If desired, company engineers will develop special purpose production equipment.

Off the Floor Deliveries!
ON
TRINDL SUPER INDUSTRIAL ARC WELDER
DESIGNED FOR HIGH SPEED PRODUCTION ARC WELDING

TRINDL SUPER INDUSTRIAL ARC WELDERS, the result of many years of careful engineering and "job tested" research, are rolling up impressive production records. Acclaimed for superior performance, ruggedness, dependability, and economical operation. For better, faster welding, easy-to-operate TRINDL SUPER INDUSTRIAL ARC WELDERS will help step up your production schedules 20% to 40%. Manufactured in a range of distinctive sizes to accommodate every type of shop and production welding job. Trindl Welders, Electrodes, supplies and accessories, available for immediate delivery, will save you both time and money.
Write, wire or phone for full details

TRINDL PRODUCTS, LTD.
17-AT EAST 23rd STREET
CHICAGO 16, ILL.

THE NEW DEARBORN MODEL "B"

AUTOMATIC

Write for folder

CHUCKING AND INDEXING FIXTURE

FOR USE ON MILLING MACHINES

The Dearborn Fixture meets the demand for automatic chucking and indexing, permitting several operations on the same piece with only one setting. Its simplicity of design, high precision, milling accuracy and speed of operation has led to its adoption by many of the leading manufacturers thru-out the country.

Work held by automatically opening and closing collets. Work automatically ejected. Indexes without loss of time for milling 1, 2, 3, 4, 6, 8, 12 or 24 sided pieces.

ANSONIA, J. W. Dearborn CONN., U. S. A.

HAMILTON

SWISS TYPE

GEAR HOBBERS

... for Accuracy and speed in hobbing PINIONS GEARS and SECTORS

TWO MODELS

No. 00 SPUR GEAR HOBBER (Illustrated) for work up to 2" diam.

No. 1 SPUR and SPIRAL GEAR HOBBER for work up to 6" diam.

Write for further details to

TRIPLEX MACHINE TOOL CORP.

Exclusive Sales Agents

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Manufactured by

The Hamilton Tool Co.

Hamilton, Ohio

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SANDING—RUBBING MACHINES

SOLVE YOUR SURFACING PROBLEM

Rotary or Oscillating types.

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THE NEDCO COMPANY

WALTHAM MASS.

All grip—no slip . . no bearings, friction, heat or lost power . . push out type . . full spindle capacity or over . . automatic adjustment . . work re-set without stopping lathe . . 2 sizes, 1" and 2" capacities . . order now with proper priorities.

Immediate deliveries.

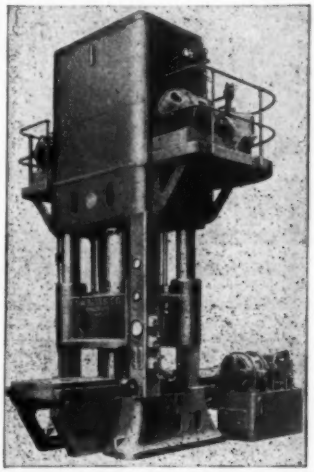
HALL MANUFACTURING COMPANY

622 Tularosa Dr. ★ Ph. NO 9679 ★ Los Angeles 26, Cal.

★ ★ THE HILLIARD ★ ★
SINGLE REVOLUTION Clutch
Wherever extremely accurate control of intermittent machine operation is essential the Hilliard Single Revolution Clutch is unequalled. Its accuracy has won for it the acceptance of industry for cutting, punching and packaging operations.
★ WRITE TO-DAY!
THE HILLIARD Corporation
126 WEST 4TH ST. ELMIRA N.Y.
★ OVER-RUNNING SLIP CENTRIFUGAL FRICTION ★

BLISS SELF-CONTAINED HYDRAULIC FORGING PRESS

A recent Bliss development is this huge 1,100 ton press, equipped with 35-ton ejector and sliding die table. It is electrically controlled and interlocked by means of this control so that the press, die slide and ejector operations can only occur when different actions are in their proper positions. The 150 hp pumping unit permits these speeds:



Quick advance—750" per minute; Pressing-37": Return-725". Equipment with faster speeds is available if required.

Four methods of operation are provided for the main slide:—Semi-automatic cyclic operation; full automatic operation; joggling control by means of a drum type switch permitting small reciprocations of the press; and inching control, permitting small increments of approach of the press by push button.

Makers point out that the universal control features of this press have been in use for over two years on presses engaged in manufacture of aluminum billets and aluminum drop forgings. Presses of this design are available in capacities up to 1,500 tons.

Further information may be had by writing the Hydraulic Sales Dept., E. W. Bliss Co., 53rd St. & 2nd Ave., Brooklyn, 32, N. Y.

CLEAN MOTORS LAST LONGER

BLOW out harmful dust, dirt, lint, etc. with the TORNADO Portable Electric Blower. Prolong motor life. Prevent blowouts. Reduce replacements and fire hazards. Soon saves cost. Investigate.

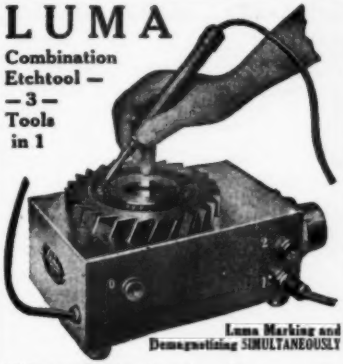
Write for details and FREE TRIAL Offer

BREUER ELECTRIC MFG. CO.
5118 N. Ravenswood Ave., Chicago, Ill.

TAKE THE DUST OUT OF DUSTY JOBS
TORNADO
PORTABLE ELECTRIC BLOWER

LUMA

Combination Etchtool — —3— Tools in 1



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Writes on hardened steel — demagnetizes at the same time—with carbon point does light spot annealing and soldering jobs. Compact—easy to use—dependable.

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Machined Steel DIE SETS Semi-Steel

Headquarters for Standardized Die Sets, embodying many exclusive features and embracing more than 195,000 stock sizes and 46 different styles. A die set that is unsurpassed. Let us prove it!

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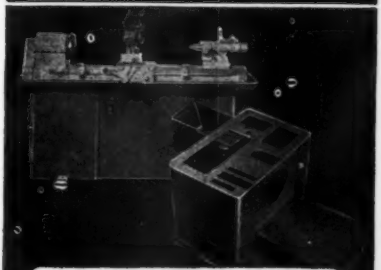
MACHINE BASES



Any size or shape can be made in our modern plant. 61 years experience forming and fabricating plate and sheet steel is your assurance of quality products. Send blueprints.

LITTLEFORD
LITTLEFORD BROS., INC.
435 E. Pearl St., Cincinnati, O.

KENNAMETAL ISSUES CATALOG

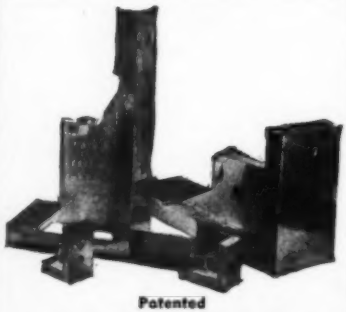
Kennametal Inc., 135 Lloyd Avenue, Latrobe, Pa., has just issued a new Catalog 43C, in which the prices of standard tools and blanks have been reduced. It embodies three well-illustrated sections.

The first contains specifications and prices of standard tools together with line cuts, halftones, and representative applications.

The second section gives similar information for typical tools, including new lines of solid round and solid square KENNAMETAL precision boring tools; also information on standard and non-standard blanks, and KENNAMETAL specialties, such as lathe and grinder centers, balls, gage tips, etc.

The third section deals with the origin and characteristics of KENNAMETAL, how to select the proper grade, how to specify and order tools and blanks, information on the several types of chip breakers, instructions on brazing blanks to tool shanks, proper grinding methods, and the milling of steel with carbide tipped cutters of simple design.

Copies will be sent upon request.



Patented

Angle plates for boring mills, drills, lathes, grinders, layout, inspectors, vee blocks, parallels, surface and lapping plates.

TATRA TOOL CO.

16317 Sanford Ave. Cleveland, O.

BALL BEARINGS IN THE WAR

To give a quick picture of the importance of ball bearings in this highly mechanized warfare, the New Departure Division of General Motors has issued

OPEN THE WAY TO GREATER PROFITS

BY USING S & S HINGES

BUTTS AND CONTINUOUS LENGTHS — for GUARDS — CABINETS — CASES — BOXES — LUGGAGE

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S & S MACHINE WORKS

HARDWARE DIVISION

4539 WEST LAKE STREET CHICAGO 24, ILLINOIS

The Bendix Vernier Caliper

(A Lafayette Tool)

TOTAL LENGTH: 8 INCHES

MEASURING CAPACITY 5⅛ In.

4 Measurements: Outside, Inside, Depth, and Depth of Threads.

SCALES:
1/16 with Vernier: 1/128 in.
.025 in. with Vernier: 1/1000 in.

Net Price $10.75

HARDENED MODEL
Net Price $16.00

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LAFAYETTE TOOL & SUPPLY CO.
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STEEGE MOTOR DRIVES FOR DEFENSE GUARANTEED FOR FIVE YEARS

No chance of breakdown, doing a good job powering machines for defense production. No noise, floating cone, results 100% power. 8 years of production proof of durability. Easily installed.

PRICED AT $40. AND UP. FOR LATHES, SHAPERS, MILLERS, ETC. IMMEDIATE DELIVERY. *Send for descriptive pamphlet.*

W. L. STEEGE MACHINERY CO.
100 So. Jefferson St., Chicago, Ill.

STERLING DRILL GRINDER

CAPACITY:
⅜" to 2½" drills.
5" x 9" adjustable table.

MOTOR: ½ hp, 3450 rpm.

NET WT: 250 lbs.

CRATED: 320 lbs.

PRICE: $150.00.

McDONOUGH MANUFACTURING CO.
EAU CLAIRE, WISCONSIN, U. S. A.

USE ECONOMY — DERIVE ECONOMY

SOCKET HEAD CAP SCREWS

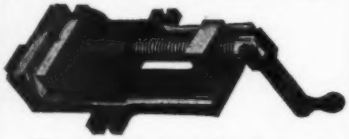
MILLED FROM BAR

HOLLOW SET SCREWS

MADE OF ALLOY STEEL

ECONOMY MACHINE PROD. CO., 5207 Lawrence Ave., Chicago, Ill.

YOST DRILL PRESS VISE



This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

Offered in two sizes.

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	3½	12½
2D	5	5½	23

Do you need a vise of ANY type?

Write today for bulletins on the extensive Yost line

YOST MFG. COMPANY
1335 SO. MAIN ST.
MEADVILLE, PENNSYLVANIA

Save TIME and MONEY

WITH THE

"BLANER"

Universal Hand SPRING WINDER

Every shop and tool room needs it . . . a strong, dependable unit . . . quickly set up in any vise.

Increases production of hundreds of sizes of springs.

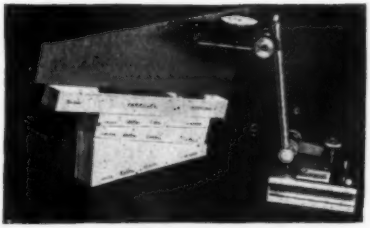
Write for illustrated folder, giving complete details

THE JOHN BLANER COMPANY
Corner Meek & Elm Sts.
SHARON PENNSYLVANIA

a booklet illustrating the various types of ball bearings used in aircraft, tanks, trucks, ships, etc. These bearings range in size from those a little larger than the head of a common pin for pivots of aircraft instruments, to the 33 pound differential bearings of medium tanks. They include such unusual installations as 61 in the Norden Bombsight and 3,469 in the M-1 Seacoast Computer for directing the fire of our largest coast defense guns.

The booklet ("BB" available on request) also illustrates their many "Famous Firsts" such as the first bicycle coaster brake, the Yellow Taxicab, the Rockwell hardness tester, automobile engines with cylinders cast en bloc, bearings with their own oil-circulating system, and other innovations by New Departure.

WEBBER ANGLE GAGE BLOCKS

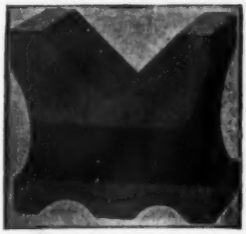


A new aid to precision measurement, in the form of sets of angle gage blocks is offered by the Webber Gage Co., 12905 Triskett Rd., Cleveland, 11, O. These are furnished in sets of 14 blocks in 3 Series;—The 1st Series includes 1-3-9-15-30-45 degree angles. The 2nd Series provides for measurements in 1-3-9-27 minutes. The 3rd Series is divided into seconds and provides for measurements of 1-3-9-27 seconds. Thus, a complete set of the blocks will provide for any angle from 0 to 103 degrees, a total of 370,800 angles in steps of one second of an arc.

The working surfaces are optically flat, the blocks wring together and adhere the same as regular gage blocks. Each set includes a parallel and knife edge.

In use, the blocks are selected from the set which when added or subtracted, will yield the required angle. No mathematical computations are involved in using the blocks. With each set is furnished a table showing which blocks to use and how to combine them to obtain any angle required. The recommended practice is to keep a set of the blocks for "masters". Other sets can be located in

"TRU-V" BLOCKS



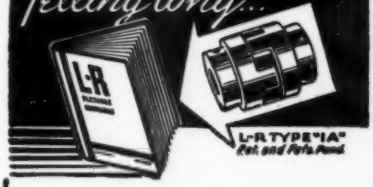
Why Not Save Time—by having enough V-Blocks available at all times in your shop to avoid the delays involved in make-shift set-ups and tie-ups?

"TRU-V" Cast-Iron Blocks are available in nine sizes—from 3½ to 10", in three styles. Each block is carefully machined on all sides, with close limits held within .001" where required. A machined ledge on both sides provides for clamping on machine bed.

Let us send descriptive bulletin.
Or contact your mill supply dealer.

Oliver Motorcraft Corp.
2532 S. Wabash Ave., Chicago, Ill.

SEND FOR L-R CATALOG
Telling Why...



—this is the most widely used of all couplings!

Only 3 parts. Sturdiest, most dependable for small pumps fractional h.p. motors, etc. Corrects misalignment. NON-LUBRICATED.

L-R FLEXIBLE COUPLINGS

range for all duties to 2500 h.p. Pick the *right* coupling by aid of Selector Charts, free with Catalog. Wire or write.

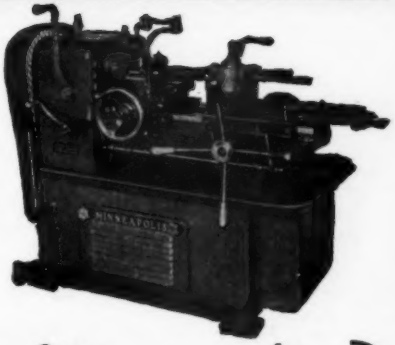
LOVEJOY FLEXIBLE COUPLING CO.
5026 W. Lake St., Chicago, Ill.

HEAVY CUTS *without* "CHATTER"

A Real "Round-the-Clock" Production Booster

The MINNEAPOLIS PRODUCTION LATHE turns out a big volume of work with inexperienced operators. Its simplicity makes it ideal for use by women. Takes 2¼" round bar. 14" swing. Very adaptable for any production set up. Excellent for second operations behind automatics. A quality machine tool at an economy price.

Write for Bulletin.



CENTRAL MACHINE WORKS CO.
1222 CENTRAL AVENUE
MINNEAPOLIS 13, MINN.

THE *Minneapolis* PRODUCTION LATHE

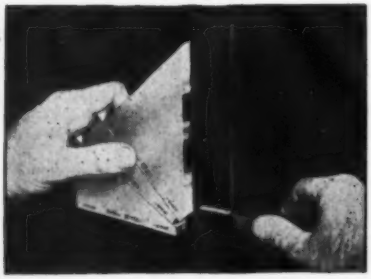
DIAMOND ACME TOOLS

Diamonds vary in quality and it is important to use the proper kind for a given job. "Bargain diamonds" are not an economy.

If you don't know diamonds know your diamond dealer. Our 45 years in this field merits your confidence.

ACME DIAMOND TOOL CO.
15 MAIDEN LANE, NEW YORK, N. Y.

the shop for use by mechanics for setting up work on grinders, milling machines, etc. These blocks can be used wherever angles must be measured. Their value in this connection is limited only by the resourcefulness of the user.



In Fig. 1 a sample work piece is shown on which one angle of 13 degrees is desired. The work piece is resting on a parallel which is wrung to the proper combination of blocks to form 13 degrees. The entire set-up is pressed against an angle plate to line up all vertical surfaces in one common plane. It is then a simple matter to indicate across the top of the work piece to determine the correctness of the angle.

Fig. 2 shows a combination of three blocks totaling 90 degrees, providing a perfect square. It is possible to vary this square in steps of one second of an arc to either a greater or less angle than 90 degrees.

The third illustration shows the ease of measuring compound angles. The work piece is shown with a first angle of 14 degrees, second angle of 8 degrees, running at right angles to the first.

An interesting new four page bulletin gives full information.

CLOSED TRADE AUTOM MARK CLOSED

Plain Type

Offset Type

OPEN

OPEN

CONTINUOUS HINGES

All hinges shown can be furnished with special holes, cutouts and bends to blue-print in metals to suit the job.

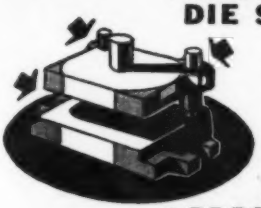
AUTO MOULDING & MFG. CO.
2326 S. CANAL ST
CHICAGO

SPECIFICATIONS:
Open Width 1/8" to 6"
Gage Material .040 to .125
Pin Diameter .101 to 3/16
Lengths to 120"

THREE-FOURTHS OFFSET

SEMI-OFFSET

DANLY PRECISION DIE SETS



THEIR PRECISION

Means Greater Accuracy In Your Production

Danly Commercial Sets

Danly Special Sets

DANLY MACHINE SPECIALTIES, INC.
2100 S. 52nd Avenue, Chicago, Ill.
MILWAUKEE • LONG ISLAND CITY, N. Y.
DAYTON • DETROIT • ROCHESTER
CLEVELAND • PHILADELPHIA
Ducommun Metals & Supply Co.
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DANLY PRECISION DIE SETS

HARGRAVE

the right CLAMP for every job

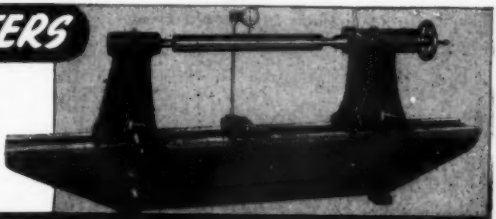
War plants are taking our entire output of clamps, chisels, punches and other tools—and gaining increased efficiency and improved results. These heavy demands make it difficult to fill all orders. See your supplier—he'll do his best to help.

Stock sizes range from ¾" to 10" openings, from ½" to 16" deep, all patterns, all sizes.

The **CINCINNATI TOOL** *Co.*
Est. 1879
1945 WAVERLY AVE. CINCINNATI, OHIO

BENCH CENTERS

Removable Centers are tool steel, hardened and ground. Equipped with screw tail-stock. Made in sizes to swing diameters of 12", 18", 21", 24", with base 36" and 48" between centers.



MICHIGAN DRILL HEAD CO. 971 E. 8 MILE ROAD HAZEL PARK, MICH.

Minn-Kota TAP GRINDING TOOL

with Holding Fixture for Bench Grinder

This inexpensive equipment quickly saves its cost. You can regrind old, worn taps repeatedly and make them cut like new again. Grinds any desired chamfer and relief uniformly on all flutes of plug or taper taps, right or left hand. Send for circular.

MINN-KOTA MFG. CO., Dept. 904, Fargo, N. D.

Fixture adjustable to fit any bench grinder.

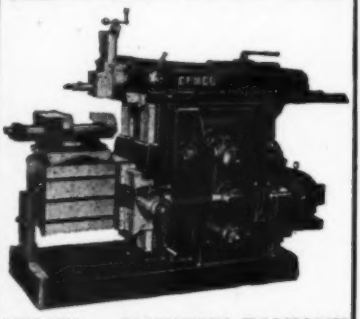
TRI-BIT FLY CUTTERS

Tri-Bits, manufactured by Weddell Tools, Inc., 1239 University Ave., Rochester 7, N. Y., have been applied to fly cutters, made with one or more teeth, set at suitable rake and shear angles. They are being used for high speed milling operations, particularly for milling aluminum or magnesium or carbide milling of steel. The cutter blades may be ground for roughing or finishing. Or one blade may be ground to cut on the diameter for roughing with the other set ahead on the face and ground under diameter with a lead, for finishing.

The triangular tool bits are rigidly locked in position, clamped home into a V-shaped hole by a single lock screw. Blades are backed up by single lock screws, affording a simple means of adjustment for size or wear. Tri-Bits are furnished in high speed steel, cast alloys or carbide tipped.

The cutter bodies are of heat treated alloy steel or of Meehanite castings. Tri-Bit Fly Cutters, 2½" diameter and up, are furnished either with solid shank, or of the shell type to fit standard or special arbors.

GEMCO MULTI-PURPOSE **SHAPERS**



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GENERAL ENGINEERING & MFG. COMPANY

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THE WONDER CUTTER

Cuts wire or rod up to ⅝ inch round (⅜ inch square) and band iron up to ⅛ by 2 inches. Adjustable stop for repeated cuts to same length. Hardened cutters last indefinitely.

Powerful leverage makes all cuts easy. Small size permits placing wherever convenient.

Small in size but a giant for work. The lowest priced rod and band cutter on the market. Every shop needs one. Hundreds in use.

You can get one for free trial in your own shop.

Write today for further details and price!

THE FEDERAL FOUNDRY SUPPLY CO.
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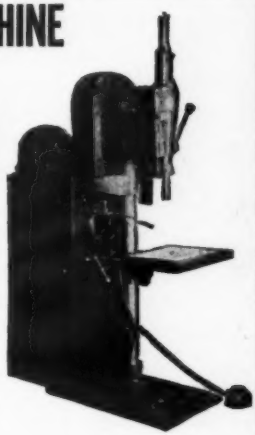
LEAD SCREW TAPPING MACHINE

FIVE OUTSTANDING ADVANTAGES

- Lead screw controlled
- Split second reverse
- 100% automatic
- Finger tip control
- Precision depth stop



The movement of the spindle is push button controlled; and can be stopped in any position desired. The spindle rotation can be started in either clockwise or anti-clockwise direction, raised or lowered at operator's convenience. 100% automatic or manually operated which ever the job demands. The sensitivity of the control is made possible by use of precision limit switches which actuate by a movement of less than .010 making it possible to reverse the motor within two cycles.

Designed to tap either right or left hand threads; definite depth of thread will be the same in each piece tapped, to within a .005 limit.

The clutch is adjusted by a nut at your finger tip. Speeds range from 35 to 250 RPM.

MANUFACTURED BY

CLEVELAND TAPPING MACHINE CO. CLEVELAND, OHIO

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HARDENED and GROUND

These Parallels are straight and true in all sizes. Sizes are specially selected for their convenience and general usefulness.

Width	Heighth	Length	Net Prices	Width	Heighth	Length	Net Prices
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1/4	1/2	6	3.00	11/16	1 1/4	12	7.25
1/4	5/8	6	3.00	3/4	1	12	7.00
1/4	3/4	6	3.50	3/4	1 1/4	12	7.50
3/8	1/2	6	3.50	13/16	1 1/4	12	7.75
3/8	5/8	6	3.50	1	1 1/4	12	8.00
3/8	3/4	6	3.50	1	1 1/2	12	8.50
1/2	5/8	6	4.00	1	2	12	9.50
1/2	3/4	6	4.00	1 1/2	1 1/2	12	9.00
1/2	1	6	4.00	1 1/4	1 3/4	12	9.50
1/2	5/8	9	5.00	1 1/4	2	12	10.50
1/2	3/4	9	5.00	1 1/4	2 1/2	12	12.00
1/2	1	9	5.00	1 1/2	2	12	12.00
3/4	1	9	6.00	1 1/2	3	12	15.00
3/4	1 1/4	9	6.00				

TOLERANCE .0001" To .0002" in 12"

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ACME TOOL COMPANY, 200 Church Street, New York 13, N. Y.

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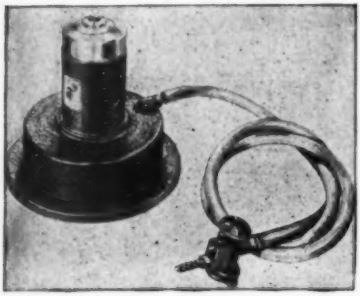
PNEUMATIC COLLET FIXTURE



A new precision fixture, for drilling, milling, etc., known as Model C-18, provides a powerful, accurate grip on round, hexagonal or square work. Maximum capacity is 1" round, 23/32" square, ⅞" hex. Accurate depth stop is provided by means of a hollow ram thru which a depth rod of required length rests on machine table, clear of moving parts. Fixture is furnished with adaptor for connecting ram to any standard draw-in collet up to 1" capacity; a corresponding closing-ring is pressed into top of housing. Purchaser may use his own collets, or order them with fixture at current prices.

Valve furnished with fixture may be operated by foot pressure, or may be mounted for automatic operation by machine.

It is asserted that "high torque" threading jobs are easily handled. That gripping power is adequate to hold cylindrical work of alloy steel while threads are cut on outside with self-opening die heads or ordinary dies. Fixture is sealed so that lubricants and coolants may be used freely.

An alternate housing (C-1805) is available with sealed openings so that oil may be pumped up thru collet, forming a fountain which washes away chips.

A special base can be furnished containing an automatic ejecting mechanism, also air operated. This mechanism is actuated by a second control valve which can be operated by foot pressure or automatically.

The fixture is made by Mead Specialties Co., 15 So. Market St., Chicago, 6, Ill.

NEW!

MODEL SP400

BRADY-PENROD

SELF-PRIMING CENTRIFUGAL COOLANT PUMPS

"They Pump Air"

Through clever application of the fundamental principle of Patent No. 2,164,869, these pumps are simple in design, thoroughly dependable and instantly self-priming on normal suction lifts encountered with machine tools. Model SP400 is sturdily built, with all the superior BRADY-PENROD features, to handle abrasives and steel chips. Easily installed on present machines or quickly adapted to new machines.

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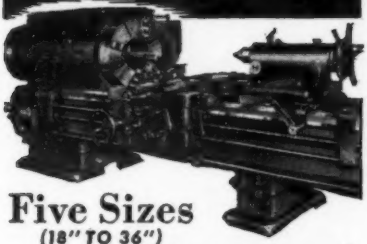
Large Hollow Spindle Type



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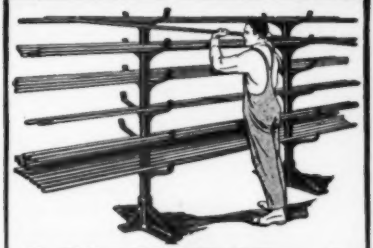
IN YOUR STOCK ROOM



The BROWN SECTIONAL RACK saves the time wasted end-hauling stock from the old-style, closed-side rack and quickens the selection of sizes by greater visibility. Built of standard metal sections: can be expanded for changes in stock or growth of business. Made in 5 styles: can't burn, depreciation practically nil.

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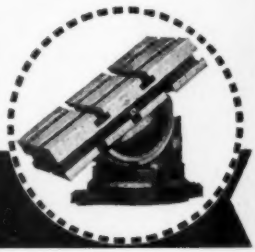
The Platen greatly increases the capacity of the unit. Vise and Platen are interchangeable.



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Adapted for heavy duty work. Precision type ball and roller bearings assure maximum capacity for high speed production and long service.

NIELSEN, INC. LAWTON, MICH.

VICTORY ABRASIVE POINTS

Abrasive Co., Tacony & Fraley Sts., Philadelphia, 37, Pa., announces a new development in mounted wheels and mounted points—Victory Points, with demountable spindles.

It is pointed out that ordinary mounted points waste steel because the mandrels or spindles are discarded when the abrasive point is used up. With Victory Points, the demountable spindle can be removed and used again and again on other points, with resultant savings of critical steel.

These points consist of a threaded porcelain bushing inserted in and fused to the abrasive wheel mass at the high heats of kiln temperatures during the vitrification process. The threaded bushing is, therefore part of the abrasive wheel mass. The demountable spindle simply screws into the porcelain bushing and forms a tight fit so that the spindle cannot break off, pull out or twist, or turn. Yet, it can be unscrewed easily to replace with a new point. Making the change is a matter of seconds. Spindle need not be removed from the grinder chuck or head.

The points are made in standard grain and grade combinations in vitrified bonded wheels or points. Demountable spindle size is limited to ¼" diameter by 1¼" length.

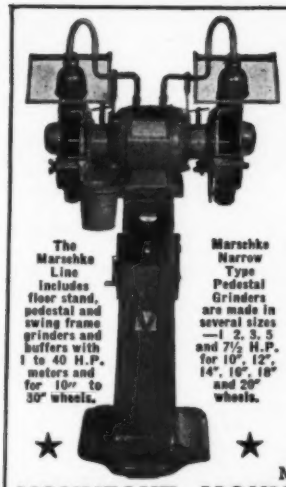
DIAMOND-TOOL HONE

The Tungsten Alloy Mfg. Co., Newark, N. J., now offers a new "Tamaloy" diamond hone.

Operators well know that keeping machine tools sharp speeds output, minimizes work spoilage and saves set-up time in changing to new tools. Makers claim carbide tools require less grinding if honed and kept highly polished, either before each shift or while tools are in the machine.

In Tamaloy hones, a matrix of tungsten carbide holds the diamonds in place. This is claimed to resist wear, prevent displacement of the diamonds when they contact a hard surface or edge, and lengthen the life of the hone.

The hones come in three grades:—rough, 100 grit; medium, 150 grit; fine, 200 grit. They are mounted on a convenient non-slip handle.



The Marschke Line includes floor stand, pedestal and swing frame grinders and buffers with 1 to 40 H.P. motors and for 10" to 30" wheels.

Marschke Narrow Type Pedestal Grinders are made in several sizes —1, 2, 3, 5 and 7½ H.P. for 10", 12", 14", 16", 18" and 20" wheels.

MARSCHKE 1 H.P. Pedestal GRINDER

***Shown with Lights and Eye Shields.**

For tool sharpening and other freehand precision grinding you will want a grinder with *smooth, true spindle rotation.* It saves high-priced grinding wheels and it accounts for better grinding. You get these basic requirements in the Marschke Pedestal Grinder. You also get the *safe, time-saving, dependable* Universally Adjustable Marschke Guards. This machine, as shown, is the best for tool sharpening and other freehand precision work but the same 1 H.P. grinder—without lights and eye shields—is available for general purpose and small parts production grinding. You will like this machine.

Manufactured and Sold by the

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See **BURCOTT MILLS** *for* **INDUSTRIAL TEXTILES**

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Plain, waterproofed and fireproofed canvas cloth. Also, drop-cloths, containers, filter cloths, etc. made to order.

★ **CHEESECLOTHS**
All grades and thread constructions of bleached and unbleached cheesecloths—all are commercially lintless. Also mill remnants as low as 1½c per yard.

★ **TOWELS**
Factory hand towels, machinery wiping towels, dish and glass wiping towels.

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Only bleached white, laundered and ironed cloths—can be washed and used over and over again—several sizes available.

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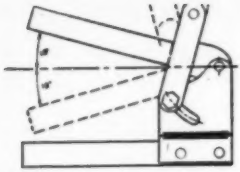

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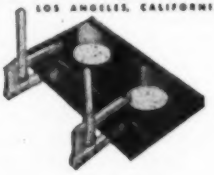

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Two companion machines that for outrange in versatility and ease of operation any combination unit. The Grob Band Saw and the Grob Filer embody exclusive principles of design and construction not found in any other single machine. Write us for details which prove their place in your plant.
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CALDER CATALOG

Two new pieces of literature have been announced by the Calder Mfg. Co., 626 N. Prince St., Lancaster, Pa. One is a new catalog No. 38 showing their complete line of grinding wheel dressers and cutters (Huntington type). The other is a folder describing the advantages of their dressers and cutters. The catalog includes a short history of their company and contains pictures of many of their products. Both pieces of literature are available on request.

NORTON MULTIPURPOSE GRINDER

An attractive, well-illustrated broadside pictures and describes the new Multipurpose grinder, recently developed by the Norton Co., Worcester, 6, Mass. It is said to be unusually versatile in construction and in application. The circular shows several interesting typical applications of their grinder, as well as a table giving all specifications.

CASTOLIN EUTECTIC ALLOY AND FLUX

A bulletin issued by the Eutectic Welding Alloys Co., 40 Worth St., New York, N. Y. gives instruction on the use of their Alloy No. 1900. Data is given on the physical properties of welds; tensile strength; binding temperature, rod and flux; preparation of the joints; and where it should be used. Several interesting paragraphs are devoted to information on preheating of castings; welding on castings; welding on sheet, and finishing. Copy of the bulletin may be had on request.

ECON-O-MATIC DRIVE HANDBOOK

A new 70-page Handbook explains the unique automatic belt tension control feature of American Econ-o-matic Drives.

It shows you how and why Econ-o-matic Drives increase machine production thru eliminating belt slip, increase belt and bearing life and reduce drive maintenance. In addition, the Handbook gives complete V-belt and Flat-belt drive selection tables, specifications and installation instructions. Address Dept. 131, The American Pulley Co., 4200 Wissahickon Ave., Philadelphia 29, Pa.

QUENCHING

A new 52 page bulletin—"Houghton on Quenching" presents a lot of helpful up to date information on this important phase of heat treating. A number of photomicrographs, charts and tables are included, making up a very interesting manual on the subject. Address B.F. Houghton & Co., 303 West Lehigh Ave., Philadelphia, Pa. for your copy.

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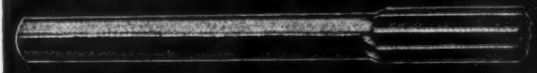

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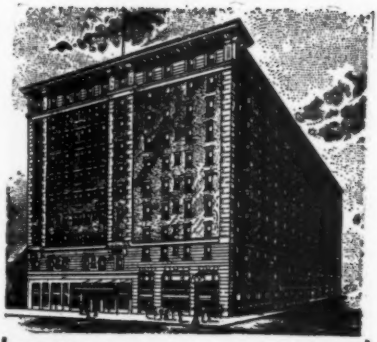

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CINCINNATI, OHIO

SUPER-CUT DIAMOND WHEELS

A newcomer in the field of diamond bonded wheels is the new Super-Cut just announced by Industrial Abrasives, Inc., 3724 West 38th St., Chicago 32, Ill. A new secret bonding process is claimed to give Super-Cut Diamond Wheels an unusually long life, The new bonding process is said to set each individual diamond solidly and uniformly in a special metal, giving both fast cutting and long life.

Super-Cut Diamond Bonded Wheels are made in a wide variety of types and sizes, and are thus adaptable to hundreds of tool and grinding operations.

It is asserted that the new Super-Cut Diamond Wheel is especially adapted to the new program of tool conservation and superfine finishing now employed in up-to-date plants.

PIPE BENDING HANDBOOK

The Copper & Brass Research Ass'n., 420 Lexington Ave., New York, 17, N. Y. announces publication of a new and complete treatise showing methods and devices for bending pipes and tubes of copper and its alloys. It contains 80 pages of text with 113 figures and illustrations including 35 pages of unit weights of tubes of different alloys with varying

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Keeps Hands out of Danger Zone—

PICKS up flat-surface materials and feeds them into punch presses. Keeps operator's hands out of "danger zone". Reduces risks, layoffs, time and money losses.

Simple and easy to operate. Place cup on work, pull trigger to pick up—release trigger to drop piece held. Strong vacuum in cup holds in material to be fed into press. Single or double-cup types.

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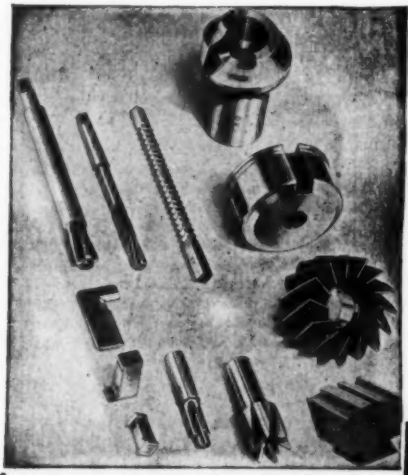

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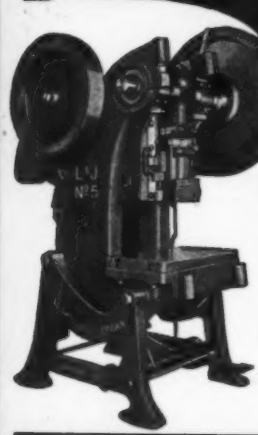

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diameters, wall thicknesses and shape, as well as pertinent information on the chemical and physical properties of such pipe material.

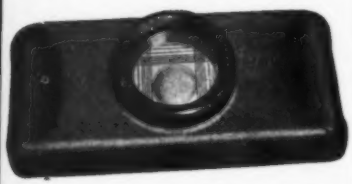
The text covers subjects such as hot and cold bending, minimum radii, temper and use of mandrels of various types. Bending with the use of filler materials such as sand, rosin, salt and low melting temperature alloys are described and illustrated. Procedures for both smooth and wrinkle bending of large diameter pipe show methods and equipment.

BARNES DATA BOOK

New literature offered by W. F. and John Barnes Co., Rockford, Ill., includes six sections of a 50-page data book, viz., "Multiple Drilling and Reaming Machines"; "Boring and Facing Machines", "Milling Machines;" "Deep Hole Machines;" "Miscellaneous Machines" and "Data Sheets." Books are available to those having a voice in the selection of new plant equipment, and request must be written on the company's letterhead.

From time to time, the company will prepare and mail additional information to all persons having copies of the data book. They plan to issue a series of data sheets illustrating and describing how certain jobs were tooled-up, etc.

FELL PRECISION LEVEL



A precision "all-way" level for use in machine tool building, setting up and maintenance, whether for establishment of level working surfaces or for the accurate checking of straightness where true level itself is not required.

Graduations are in .0005" per foot and form squares about a circular bubble, thus giving coordinate readings and showing the direction and amount of slope, if any. Made in two sizes—5½"x12"; 3½"x6".

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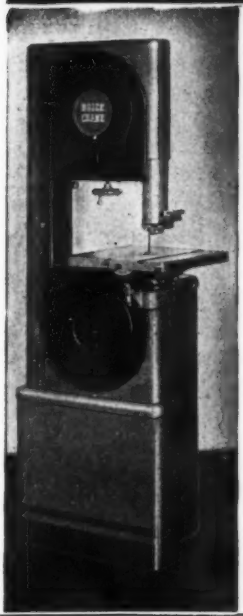
You can get QUICK DELIVERY from Boice-Crane



LOOK AT THEM ALL AND YOU'LL BUY A BOICE-CRANE MODEL 2300, 14" STEEL CLAD BAND SAW

Better balance allows higher speed in cutting of metal, wood, plastic and paper. Cuts stock up to 8⅝" thick and handles 27" diameter work. The Boice-Crane cuts freer and finer, reducing sanding costs on end cuts.
Strong, light wheels effect exceptionally quiet, vibrationless operation.
Wheel guard swings on hinges and must be closed before machine can be operated.
Telescoping blade guard holds by friction when lock handle is released. It will not drop while adjusting.
Tool and die makers appreciate the new blade guide design which handles blades from ⅛" to ¾" and is conveniently adjustable by single knob control.
The 15" x 15½" table is rigidly supported on two large trunnions. No portion can sag under heavy cuts. Tilts 45° to right, 10° to left, degree of tilt indicated by convenient scale.
Single and eight speed models. A model to suit most shop needs and efficiently saw every kind of material.
Heavy duty gears transmit as much as one horse power at lowest speed with a wide margin of safety. All gears run in oil.
On floor model all moving parts, including motor are fully enclosed and sealed against dust and grime. Given top rating by State Safety Commissions.
Also available in bench model.
A battery of 6 to 10 Boice-Crane Saws cost no more than some single machines of big size.

BOICE-CRANE OSCILLATING SPINDLE SANDER

Rapid production. Uses smallest diameter abrasive sleeve of any low priced spindle sander. Sands any degree of bevel up to 6 inches in height. Large, tilting work table.

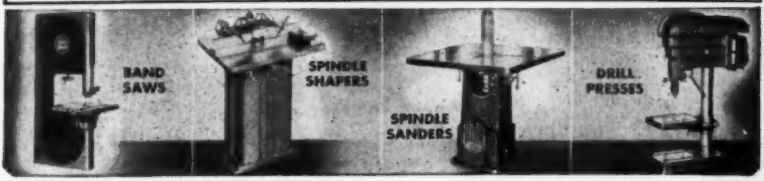
FOR NEW FREE DRILL PRESS CATALOG USE THIS COUPON

BOICE-CRANE COMPANY • 936 Central Ave., Toledo 6, Ohio

Name_____

Street_____

City_____



The CARTER GUIDE-LINE LIGHT that Casts a Black Shadow-Line!

SHOWS PATH OF SAW BEFORE THE CUT IS STARTED

"BLACK MAGIC" is what sawyers of plastics, metals and woods call the help the new Carter Guide-Line Light gives them. From the type of work speeded by 8 of these units for the New England Box Co. to that done by 2 of these units at the Portsmouth Navy Yard, sawyers of plywoods, plastics, sheet-metals and woods are increasing output, saving time and vital materials, doing the jobs better—with less eye and muscular fatigue.

1¢ per Hour Cost for Light!

LAMP, LENS, SHADOW-LINE and HOUSING ARE ADJUSTABLE

SPEEDS SAWING OF PLASTICS, METALS and WOODS

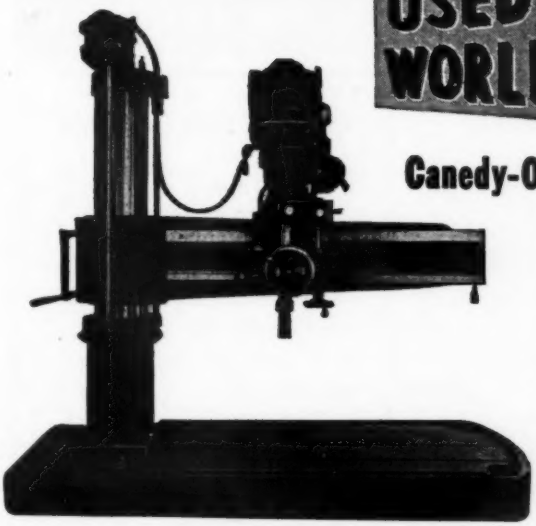
●

Write for Bulletins Describing These 3 NEW "VICTORY" TOOLS:

Six-page letter-head size file-folder illustrating and giving all facts on the new CARTER GUIDE-LINE LIGHT—and covering its quick, easy installation and application to all types of jobs; Two-page letter-head size file-folder on the new CARTER PRECISION MICRO-GUIDE (for bandsaw blades) having renewable, replaceable, micrometric-adjustable jaws and quick-detachable and replaceable guide-wheel wearing rings; and Six-page letter-head size file-folder on CARTER RIGID BANDSAW WHEELS with QUICK-CHANGE DEMOUNTABLE TIRES that fit all saws (30" and 36" Size) and make any good saw better.

CARTER PRODUCTS COMPANY, INC.

204 DIVISION AVE. N., GRAND RAPIDS 2, MICH., U. S. A.



USED THE WORLD OVER

Canedy-Otto Radial Drill

Canedy-Otto has been the manufacturer of first-class, high-grade drilling units since 1892. These units are available in single spindle, multiple spindle and radial.

We can help you solve your drilling problems. Send for information on our complete line

Early delivery possible.

SPECIFICATIONS:

	9" Column 3' Arm	11" Column 4' Arm	11" Column 5' Arm
Drills to the center of circle on base or table	73½"	96"	120"
Length of arm	3"	4"	5"
Greatest distance from spindle to base	43½"	48"	48"
Minimum distance from spindle to base	9½"	15"	17"
Minimum distance from spindle to column	10½"	10"	10"
Traverse of spindle	9½"	9½"	9½"
Hole in spindle—Morse Taper	No. 4	No. 4	No. 4
Diameter of spindle at nose	2½"	2½"	2½"
Traverse of head on arm	25½"	36½"	48½"
Traverse of arm on column	21½"	24"	22"
Spindle speeds with 1200 RPM motor	(80, 85, 130, 180, (425, 560, 860, (1200 RPM		on all models
Spindle speeds with 1800 RPM motor	(85, 130, 180, 274, (560, 860, 1180, (1750 RPM		on all models
Feeds per revolution of spindle	(.004" .007" (.010" .020"		on all models
Bearing of arm on column	14"	16"	18"
Size of main driving motor	2 HP.	2 HP.	2 HP.
Height of drill column over gears	88"	88"	98"
Working Surface of Base	22"x48"	36"x60"	36"x88"
Net weight	4000 lbs.	6200 lbs.	7000 lbs.

CANEDY-OTTO MFG. CO.

CHICAGO HEIGHTS, ILLINOIS

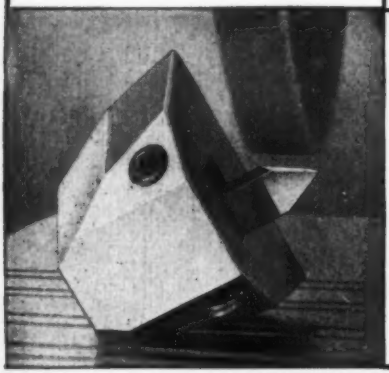
NEW CLARK THREAD TOOL GRINDING FIXTURE

CLOSE TOLERANCES

One fixture for grinding *both* National 60° and Acme 29° thread tool bits, insuring close tolerances. Saves vital materials and time. Accurate, uniform cuts. For use on any surface or cutter grinder.

CORRECT THREAD ANGLE

Every compound angle is predetermined to provide correct thread angle and clearance—no guesswork. All bits may be ground with or without rake on cutting face. Ideal for Carbide tips, all bits.



2 PRECISION MODELS

Mechanics' Model A for bits ⅛"-⅜" weighs 1½ lbs.—$16.75...Heavy duty Model B for bits ⅛"-⅝" weighs 6½ lbs.—$35.00. Both complete with right and left hand adapters. Magnetic chuck convenient but not essential. Easily clamped to work table.

WRITE FOR BULLETIN No. MTBB-1

MODELS A & B ALSO GRIND BITS FOR USE IN ARMSTRONG TOOL HOLDERS

In Canada: DOMINION BEARINGS, LTD., Toronto, Montreal, Winnipeg
Export: THE AMERICAN STEEL EXPORT COMPANY, INC., New York, Los Angeles

Robert H. Clark Company

9330 SANTA MONICA BLVD. BEVERLY HILLS, CAL. • MANUFACTURERS PRECISION TOOLS, PRECISION PARTS

DUSTKOPS
STOP DUST
from ALL
Abrasive Operations

Entirely Self-contained. Motor, fan, cyclone separator and filter. Fast installation. Flexible metal hose permits installation complete in minutes.

Compact and Portable. Even the biggest DUSTKOPS will usually fit in the existing space behind or beside the grinder.

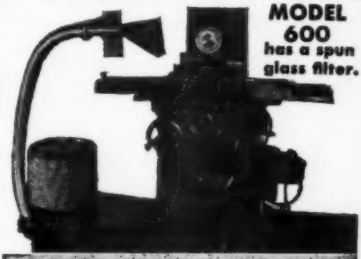
Send now for complete information. To save time, describe the source of the dust when you write.

AGET-DETROIT CO.

605 First National Bldg., Ann Arbor, Mich.
Detroit Office: CAdillac 3090—Zone 26

MODEL 950
has a cyclone separator.

"READY TO GO" this model is for medium duty work of all kinds.



MODEL 600
has a spun glass filter.

Ideal for light duty production surface grinding.

MODEL 600
Spun Glass Filter

For smallest grinders, laboratory work.

MODEL 1250
has a cyclone separator.

Handles all the dust from this armor grinding job easily.

Four wheels exhaust into a single Model 1250 that gets all the dust.

No Leaks
No Levers
No Packing

Precision made of bar brass and stainless steel.

Note powerful double grip afforded by long extra heavy ferrules, machine-formed over special shoulder on shank.

Air-O-chek AIR GUNS

The *unapproached air saving, ease of operation, and low maintenance* afforded by AIR-O-CHEK Air Guns stem from a basic patented feature — *the ball and socket connection between the internal lever and the valve.*

This *exclusive* construction affords leverage to *open the valve* with a *slight* flex of the hose. Air shut-off is *instant and positive* when the hose is released, *regardless of length of service.*

RESULTS TALK. Install an AIR-O-CHEK and *compare* results *with the best you have ever had.* Prompt delivery on high priorities. Catalog on request.

Jewelers Model FA AIR-O-CHEK — favorite of women war workers because of small size. Furnished with ⅛" or ¼" female IPT.

Standard Model FA AIR-O-CHEK. Furnished with ⅛, ¼, ⅜ or ½" female IPT.

Large Model FA AIR-O-CHEK. Furnished with ½" female IPT.

Model FA AIR-O-CHEKS come completely assembled with long, extra heavy double-grip ferrules illustrated, ready to screw on male IPT.

AIR-WAY PUMP & EQUIPMENT COMPANY, 401 S. Jefferson St., Chicago 7, Ill.

PROMPT DELIVERIES ON

New No. 2 and No. 3 Ball Bearing Lathe Centres

$16.00 Each

We also carry in stock for immediate delivery High Speed Side Cutters, Face Cutters, Morse and Brown & Sharpe Sleeves, End Mills, Jacobs Chucks, Lathe Mandrels, flat ground stock, Taper Shank Drills, Straight Shank Drills, Tool Bits, Keyway Cutters, Slitting Saws, 3 and 4 Jaw Chucks, Taps, Diamond Emery Wheel Dressers.

Set of H. S. Drills with Stands, 1-60, 1/16 to ½ by 64; A to Z

Carbon or high speed or carbide lathe centres.
Also High Speed Cutting Tools
too numerous to mention.

Victor Machinery Exchange, Inc.

251 CENTRE STREET **NEW YORK, N. Y.**

COMBINATION CENTER DRILLS

Special Alloy and High Speed Steel

Regular Type

Ground with Radial Relief

Included angle 60 degrees. Other angles made special to order.

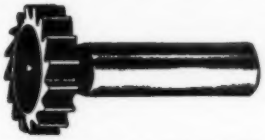
Size	DIMENSIONS Dia. Body	Dia. Drill	Length Overall	PRICE PER DOZEN Semi-H. S. Steel Net	H. S. Steel Net
A-1	1/8"	3/64"	1¼"	$2.50	$7.20
C-2	13/64"	1/16"	1⅞"	3.00	7.20
D-1	15/64"	5/64"	2"	3.25	7.20
E-1	3/10"	3/32"	2⅛"	3.50	7.20
E-2	3/10"	1/8"	2⅛"	3.50	7.20
F-1	7/16"	5/32"	2¾"	4.50	10.80
F-2	7/16"	3/16"	2¾"	4.50	10.80
J-1	1/2"	7/32"	3"	.....	16.20
J-2	1/2"	9/32"	3"	.....	16.20
M-1	5/8"	7/32"	3¼"	.....	21.60
M-2	5/8"	9/32"	3¼"	.....	21.60
N-1	3/4"	1/4"	3½"	.....	28.80
N-2	3/4"	5/16"	3½"	.....	28.80

PROMPT DELIVERY

Victor Machinery Exchange, Inc.

251 Centre Street • New York, N. Y.

PROMPT DELIVERY



HIGH-SPEED

NEW WOODRUFF KEYSEAT CUTTERS

High Speed — Right Hand — ½" Shank

American Standard No.	Old Standard No.	Diam. Inches	Thickness Inches	Length Overall Inches	Net
.....	201	1/4	1/16	2 1/16	$2.45
.....	206	5/16	1/16	2 1/16	2.45
.....	207	5/16	3/32	2 3/32	2.45
.....	211	3/8	1/16	2 1/16	2.45
.....	212	3/8	3/32	2 3/32	2.45
.....	213	3/8	1/8	2 1/8	2.45
204	1	1/2	1/16	2 1/16	1.96
304	2	1/2	3/32	2 3/32	1.96
305	4	5/8	3/32	2 3/32	1.96
404	3	1/2	1/8	2 1/8	1.96
405	5	5/8	1/8	2 1/8	1.96
406	7	3/4	1/8	2 1/8	2.17
505	6	5/8	5/32	2 5/32	1.96
.....	61	5/8	3/16	2 3/16	1.96
506	8	3/4	5/32	2 5/32	2.17
.....	91	3/4	1/4	2 1/4	2.17
507	10	7/8	5/32	2 5/32	2.38
606	9	3/4	3/16	2 3/16	2.17
607	11	7/8	3/16	2 3/16	2.38
.....	12	7/8	7/32	2 7/32	2.38
608	13	1	3/16	2 3/16	2.66
.....	14	1	7/32	2 7/32	2.66
.....	152	1	3/8	2 3/8	2.94
609	16	1 1/8	3/16	2 3/16	2.94
807	A	7/8	1/4	2 1/4	2.38
808	15	1	1/4	2 1/4	2.66
.....	17	1 1/8	7/32	2 7/32	2.94
809	18	1 1/8	1/4	2 1/4	2.94
.....	19	1 1/4	3/16	2 2/16	3.22
.....	20	1 1/4	7/32	2 7/32	3.22
810	21	1 1/4	1/4	2 1/4	3.22
811	22	1 3/8	1/4	2 1/4	3.50
812	24	1 1/2	1/4	2 1/4	3.85
1008	B	1	5/16	2 5/16	2.80
1009	C	1 1/8	5/16	2 5/16	3.08
1010	D	1 1/4	5/16	2 5/16	3.43
1011	23	1 3/8	5/16	2 5/16	3.78
1012	25	1 1/2	5/16	2 5/16	4.13
1210	E	1 1/4	3/8	2 3/8	3.43
1211	F	1 3/8	3/8	2 3/8	3.78
1212	G	1 1/2	3/8	2 3/8	4.13

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PROMPT DELIVERIES

HIGH SPEED END MILLS

DOUBLE END

Two and Four Flutes

Dia. of Mill	Diameter of Shank	Length of Flute	Overall Length	Net Price
1/8	3/8	3/8	3	2.20
5/32	3/8	3/8	3	2.20
3/16	3/8	1/2	3	2.20
7/32	3/8	5/8	3 1/8	2.20
1/4	3/8	5/8	3 1/8	2.20
9/32	3/8	3/4	3 1/8	2.20
5/16	3/8	3/4	3 1/8	2.20
11/32	3/8	3/4	3 1/4	2.20
3/8	3/8	3/4	3 1/4	2.20
7/16	1/2	1	4 1/4	2.80
1/2	1/2	1	4 1/4	2.80
5/8	5/8	1 3/8	5	3.44
3/4	3/4	1 5/8	5 5/8	4.20
1	1	1 3/4	6 1/4	5.40

SINGLE END

Two and Four Flutes

Dia. of Mill	Dia. of Shank	Length of Flutes	Overall Length	Net Price
1/8	3/8	3/8	2 5/16	1.40
3/16	3/8	1/2	2 3/8	1.40
1/4	3/8	5/8	2 1/2	1.40
5/16	3/8	3/4	2 1/2	1.40
3/8	3/8	3/4	2 1/2	1.40
7/16	1/2	1	2 1/16	1.76
1/2	1/2	1 1/4	3 1/4	1.88
5/8	5/8	1 5/8	3 3/4	2.40
3/4	3/4	1 5/8	3 3/4	2.52

LONG SINGLE END MILLS

Four Fluted

Dia. of Mill	Dia. of Shank	Length of Flutes	Overall Length	Net Price
1/4	3/8	1 1/4	3 1/8	1.68
5/16	3/8	1 3/8	3 1/8	1.68
3/8	3/8	1 1/2	3 1/4	1.68
7/16	1/2	1 3/4	3 3/4	2.08
1/2	1/2	2	4	2.16
5/8	5/8	2 1/2	4 5/8	2.76
3/4	3/4	3	5 1/2	3.44

VICTOR MACHINERY EXCHANGE, INC.

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Covel No. 12 Cutter and Tool Grinder
Ask for Bulletin MT-14-12

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FOR VICTORY BUY WAR BONDS

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Broken tools in your shop can be as damaging to the war effort as broken weapons on the battle field. For reconditioning worn tools and converting those broken ones for new and different uses, Covel offers you these machines — No. 12 and No. 22 Cutter and Tool Grinders, Covel Yankee Twist Drill Grinder — all three tested and proven under the rigors of war-time production.

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One-piece Bakelite number wheels are 80% lighter. Unbreakable plastic windows — streamlined to avoid shadows. All steel housings. Counter assembly has only one screw. Many other features assure dependability and long wear life beyond calculation.

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A 10" GIANT!

FOR *Wet-n-Dri* OPERATION
HANDLES WIDER RANGE OF LARGER PIECES

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OF KALAMAZOO

PRESENTS A NEW

ABRASIVE BELT GRINDER

For LARGER WORK and CLOSER TOLERANCE

Any materials that can be ground, can be surfaced or finished on the HAMMOND V-10. Many jobs now being done on shapers, milling machines, surface grinders, disc grinders, etc., can be finished much faster and better with the V-10.

- **Dimensions 74"x22"x50".**
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- **Bearings, sealed water tight.**
- **Plain Table 15"x10".**
- **Oscillating Table (shown) 15¾"—3 T-Slots**
- **Belt working surface with Plain Table 24", Oscillating Table 17½".**
- **Uses Belts up to 10" Width.**
- **Motor: 5, 7½ or 10 H. P.**

HAMMOND Model V-10
Shown with Oscillating Table Manually Operated

Special work holding fixture mounted on table.

WRITE FOR BULLETIN 302

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KALAMAZOO • MICHIGAN

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Type 400—4" Belt Grinders. Type 600—6" Belt Grinders. All machines are Wet-n-Dri Type or Dri Type Only

—Also

Backstand — Idlers for use in converting standard type Polishing Lathes to Abrasive Belt operating units.

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He doesn't have to know how to spell it. Experience has taught him that for high efficiency in the grinding and buffing department, the air must be clean—free from dirt and grit. A man can't do his best work while fighting dust-laden air. He slows up — and slows up production.

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DIVISION OF THE R. K. LE BLOND MACHINE TOOL CO., CINCINNATI, OHIO

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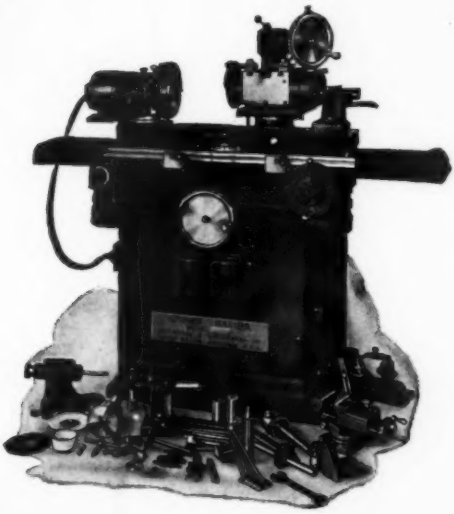
THE GRAND RAPIDS NO. 6

UNIVERSAL CUTTER AND TOOL GRINDER



THIS NO. 6 GRINDER FEATURES

- Cabinet Base Construction
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- Hardened and Ground Stainless Steel Ways
- Fixed Table Height
- Cross Movement on Column Enables Operator to Stand Close to His Machine

- Convenient Location of All Controls
- All Wheel Shafts Mounted on Grease-Sealed Ball Bearings
- Provision for Built-In Dust Collector

THIS MACHINE IS DESCRIBED IN BULLETIN 11-141

GALLMEYER & LIVINGSTON CO.

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25% ADDED PRODUCTION *with* CULLMAN DRIVES

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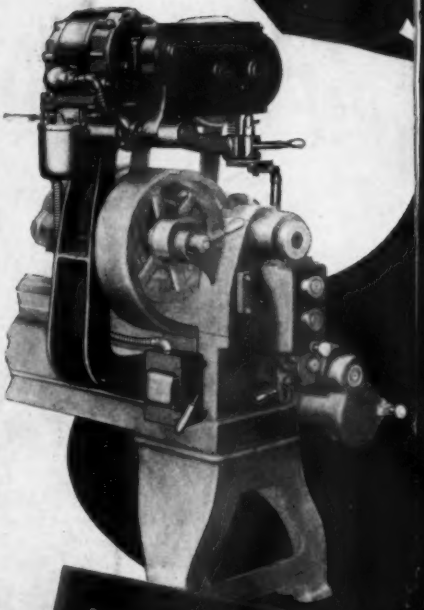
CULLMAN DRIVES convert old type equipment to give modern machine output at a fraction of the cost of new equipment---and WITHOUT DELAY.

CULLMAN DRIVES are economical to buy and to install. They are sturdily built for maximum efficiency and long life, operate quietly with belt drive smoothness, and are heavy-duty, production machines.

CULLMAN DRIVES are made for motors from ¼ to 15 H. P. Prompt delivery can be made.



INSTALLATION IS EASY

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The Cullman Drive can be installed in a short time. Only four bolts are necessary for attachment, practically eliminating loss of time in converting equipment for maximum production.

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